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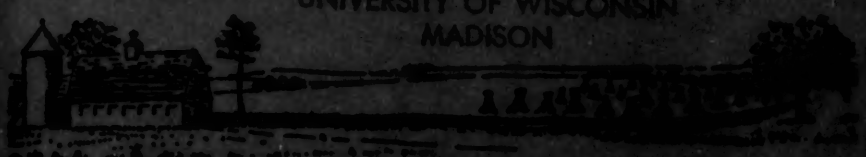

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The Farmer's Digest

Volume 14 March, 1951 Number 11

More Trouble on the Range

Condensed from The Utah Farmer

O. A. Fitzgerald
University of Idaho

JUST before noon, one November day in 1945, a herder brought his band of 1300 ewes down out of the hills onto the Raft river flats in southern Idaho. After a summer in the mountains he had returned his charges to one of the state's traditional winter ranges.

Within an hour some of those sheep began to get sick. They bunched up. Some flattened out on the ground. The herder, who had gotten a $25,000 investment safely through coyotes and cougars and other summer hazards, was panic-stricken. He suspected some poisonous plant and tried to push the band on to safe ground. Even with the faithful dogs tearing back and forth nipping heels, the herder couldn't get the sheep to budge.

By nightfall around a thousand of the woollies were as silent as the desert that was their deathbed. By noon the next day, every one of the 1300 was dead. Then followed one of the largest sheep-skinning bees any Idaho sheepman could recall. Neighbors of John Ward poured in to study the death scene, help him salvage the pelts and get a look at the killer.

Sitting on one dead ewe while skinning another, many of those sheepmen got their first look at halogeton, currently just about the hottest weed subject on western ranges. That was the first big sheep-skinning bee along the Raft river—but not the last.

Right now halogeton is a stockman's headache. It could, however, easily become one of our worst weeds nationally.

"Actually we don't know enough about the plant itself to make any predictions as to what its natural limits might be in this country," declares Lambert C. Erickson, weed research man at the University of Idaho. "If it

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Salt Lake City, Utah, October 5, 1950

turns out to be as adaptable as its close relative, Russian thistle, then look out!"

This weed, an annual, already has put many range sheepmen completely out of business and easily could wipe out livestock in other places just as it has done along Raft river.

"In the upper Raft river valley, where at least 18 large outfits wintered in years past, 11 sheepmen have been forced completely out of business," declares rangetanned Asael Lowe of Elba, the cowman president of Idaho's association dedicated to the curbing of this menacing weed.

The Idaho Halogeton and Range Weed Control association was born under unusual conditions. Following the costly flare-up along Raft river, the men who run stock on those ranges made a tour to see just how much of a foothold the deadly weed had gotten. They saw plenty. So much, in fact, that out in the desert in a sea of halogeton they held a meeting. Out of that desert gathering came their association, complete with officers and secretary.

One of the first acts of the association was to send sheepman Ward to the Western Weed Control association's meeting in Denver.

"We sent Ward because he had a story to tell and because he's the fellow who can tell it," Lowe explained.

Had it been impossible for Ward to attend the Denver weed meeting, Lowe had plenty of well-qualified alternates. At least half a dozen sheepmen who once used the Raft river ranges had been hit just as hard. In proportion to total sheep holdings, some received a more severe blow than did Ward.

"Today not a single flock can be seen in that area," declares Ward in describing the decline of sheep raising in the Raft river valley. "Given a few more years of unrestricted spread, halogeton may well cover a large portion of the entire grazing area of the Snake river valley. If so, we might as well say good-by to the sheep industry in this area."

Tracing halogeton's atomic-bomb explosion over western sheep ranges is relatively easy. This Russian weed, a native of the area northeast of the Caspian sea, first was observed in this country in Nevada about 15 years ago. Because of its exceedingly high water content, Nevada highway people once thought they had found a sure-fire highway fireproofing plant. They were toying with the dream of halogeton plantings along highways to catch carelessly tossed cigarette stubs and cigar butts. When sheepmen began reporting casualties, that dream was pigeon-holed.

Halogeton now dominates hundreds of thousands of acres in Utah, Idaho and Nevada. No one knows what the total acreage actually is. Nevada probably has the most, with Idaho next. Utah probably has a considerable acreage. Wyoming also has some.

As weeds go, halogeton is a comparative newcomer on the ranges. It is so new, in fact, that even the range stockmen aren't in accord on pronunciation. Some pronounce it with a "g" as in "gee." Others incline toward a "g" as in "get." You hear both all the time. This disagreement is limited entirely to pronunciation.

Halogeton bears striking resemblance to its close relative, Russian thistle. Often it is mistaken for the weed that helped many a stockman through the drought feed shortage. Cut at the right time, this thistle is palatable. Halogeton is a troublemaker at all times. Main difference between the two is that halogeton has a hairlike growth at the tips of the leaves.

Were it not for its deadliness, halogeton might become a welcome addition to desert loveliness. Since he has been crusading against the weed, Lowe has had many ranchers ask him the name of the "pretty new plant with the pearly red blooms." When told its name and a little about it their interest in its beauty suddenly dims.

The plants are loaded with blooms and, it would seem, those blooms are loaded with seeds, all of which pop into plants on the first growing days in the spring. In checking plant density, University of Idaho research men have counted up to 360 seedlings in a square foot. Two hundred and fifty plants have been average for their test areas.

Oxalic acid is the killer in halogeton. Late fall is the most dangerous time. As the plant grows the acid content increases, getting as high as 20 per cent in the dried plants. A couple of nibbles off that kind of a plant and a sheep feels the effects. Nevada studies have revealed that if a 100-pound ewe eats 250 grams of the stuff she is a goner. Oxalic acid precipitates the calcium in the blood. Calcium injections have been tried on sick sheep but so far there is no record of any being saved.

Although fall is the most dangerous time, reports from Nevada tell of springtime troubles, too. There are records of one sheepman losing 260 to halogeton in April, another losing 143 in May.

Halogeton has killed a few cattle," Lowe relates. "Usually, however, the cow doesn't die. But she might as well, for after eating the weed she never will get fat or raise calves. Cattle coming down on the flats from the summer ranges are the most vulnerable. If

they can get some other forage along with the halogeton they aren't hit so hard."

Halogeton has an extremely high water content. Run over a blanket of the weed in a jeep or tractor and within a few moments water will be dripping off the tires. Nature has been very kind to this plant, giving it a long taproot which goes down through the dry topsoil to a dependable moisture supply. Down at the lower level the feeder roots branch out.

Sheepmen and cattlemen alike want action. But as Lowe readily admits, little can be done in a big way until more is known about the plant itself and where to attack it.

Probing the private life of the halogeton plant is the target of a University of Idaho special research project in the Raft river valley. Plots are strung out in a big outdoor laboratory 50 miles long and 30 miles wide. It is so big that the Idaho halogeton research men got lost once in their huge workroom.

In this big valley, tests are being made on a wide range of sprays. Soils are studied. Grasses are being tried to find out which have the best chance of competing with halogeton. All angles of possible control are being explored, principally in cooperation with the bureau of land management, boss of the public grazing lands. This project has a long list of cooperators, including everyone who already has felt or may some day feel the halogeton blow.

Studies to date indicate the plant definitely invades depleted ranges and disturbed soils first. "We do not know of any soil type or climatic condition in Idaho in which halogeton will not grow," declares Dr. Edwin T. Tisdale, head of range management at the University of Idaho and cooperating head of the halogeton project.

The weed has been found from the lowest desert ranges to the juniper forests in the mountains surrounding those ranges. It grows on ranges so dry the total precipitation adds up to a scant four inches. Likewise, it does well in sections getting 20 inches. This adaptability under a wide range of Idaho conditions is viewed by many as the handwriting on the wall; a preview of what could happen if it isn't stopped.

As a result of his extensive observations on the halogeton threat throughout the range country, Erickson has these warnings:

"Large areas of desert range should not be cleared of sagebrush or other undesirable vegetation until more is known about establishing grass seedings. Halogeton appears to invade immediately following soil disturbances. It may be wise to encourage undesirable grasses, such as cheatgrass. Even cheat is preferable to halogeton.

"Any stockman who finds a small patch of halogeton on his range should stamp it out—regardless of cost. Around squirrel holes, ant hills and salting places is the first place to check. Many stockmen have seen it appear there for the first time. If those starts aren't wiped out, the weed may explode all over the range just as it has done along the Raft river ranges."

Obviously the halogeton picture is alarming. But anyone who has visited the Raft river ranges and walked a mile in a straight line—which is easy to do—without ever seeing a solitary blade of grass—which is just as easy—will agree it is not being exaggerated.

Legumes Help Build Better Soil

Condensed from Better Fruit

Dr. R. E. Stephenson
Oregon State College Soils Scientist

Of the some 12,000 species of legumes, only a few are commonly grown as farm crops. Some are grown primarily for soil improvement, and some for feed or seed, with an incidental soil improvement value.

Virgin soils usually support a varied number of wild legumes of which the lupines and various clovers are familiar examples. The locust, a legume tree, valued for making lasting fence posts, is helpful in enriching the forest soil.

The poison loco weed is a legume that no doubt enriches the soil, but is disliked by the farmer because of its poisoning effect upon livestock. Scotch broom grows abundantly and enriches the soil in local areas. Several legumes are valuable as ornamentals.

Wild legumes, sometimes rather abundant in the native vegetation of virgin areas, were originally responsible for much of the transfer of nitrogen from the air (which is 79 per cent nitrogen) to the soil. Some nitrogen is transferred to the soil by free-living bacteria in the soil which do not require a host plant, and a little nitrogen is oxidized during electrical storms and is carried to the soil by rainfall.

This accumulation of nitrogen went on for thousands of years before the farmer came into the picture, and is in large part responsible for the high fertility of virgin soils.

The legume differs from other plants in that a certain kind of bacteria (Rhizobium) enter the plant roots, usually through the

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Portland, Oregon, October, 1950

thin-walled root hairs and work their way into the tissue of the roots, finally producing a nodule or enlargement which becomes their home.

These bacteria get their nitrogen from the air, contributing part of it to the host plant in exchange for minerals, and carbohydrates, furnished by the host, which they must have to live and function.

Nodules on the legume root system vary in size, shape, number and distribution. Some are spherical and as large as peas, while others are much smaller and sometimes quite irregular in shape.

The bacteria enter the root and begin to produce nodules soon after the seed germinates and the roots have made some development. As new roots form, more nodules may develop, and old ones die and gradually rot to give up their accumulated nitrogen.

A smaller number of larger nodules, rather than a larger number of smaller ones, is associated with a high nitrogen fixing power. A favorable sign also is to find a relative grouping of the larger nodules about the tap root and the larger roots coming off from it. The nodules are easy to find if the plant is carefully dug up with a spade and the dirt removed. Forcibly pulling the plant is likely to leave the nodules in the soil.

The bacteria are so small that a single nodule may contain several million organisms, many of them dead, and therefore useless for fixing nitrogen. Presence of nodules is not a sure sign that nitrogen fixation is taking place. (Nitrogen fixation is the unknown process by which the bacteria take the free nitrogen from the air and change it to a combined form, which the host plant can use.)

Some bacteria are such inefficient workers that they fix little or no nitrogen even though they produce nodules. For this reason it is a common practice to use artificially prepared cultures for inoculating seed with virulent strains of the right kind of bacteria for the particular legume. These bacteria have been tested for their efficiency in fixing nitrogen, which assures that inoculation will take place with suitable organisms.

The amount of nitrogen fixed will vary with the legume, the inoculation, and the soil. Legumes grown on low nitrogen soils are likely to fix more nitrogen than if grown on rich soils where the supply of available nitrogen is already abundant.

Actual fixation may vary from nearly none to several hundred pounds an acre in a single season. Perhaps 50 to 100 pounds an acre annually is a reasonable fixation rate. A legume in the crop rotation is usually as effective in

providing nitrogen for other crops as is a rather liberal application of a nitrogen fertilizer.

The legume is most effective for soil improvement when the entire growth is returned to the soil as in cover cropping orchards. The good effect of the legume for increasing crop yields is usually noticeable for two or three years after the crop has been worked down. Even when the legume is harvested for seed or feed, there is at least a temporary improvement of the soil.

Vetch growers report that after two or three vetch seed crops are produced, the soil becomes almost too rich for grain. Of course the straw or the manure from feeding legumes should be returned to the land.

Legumes are excellent purveyors of all nutrients needed for plant growth. They have large, deeply penetrating root systems that bring mineral nutrients from the deep soil beyond the reach of the more shallow rooted plants. In addition to this, legumes often make more growth than non-legumes.

Common clover makes two crops and alfalfa sometimes three or more in a single season. Legumes are relatively rich in nutrient elements such as calcium, phosphorus, potassium, sulphur, boron and others. When the legume, or the residue, returns to the soil, the nutrients contained are left in the surface layers, in a form and position easily accessible and available to succeeding crops which usually thrive following a legume.

Another reason crops thrive after a legume is the good effect legumes have on the physical properties of the soil, especially the structure. The large deep roots open the soil, and leave channels when the roots rot through which water can penetrate, excess water can find its way through the soil into the drainage, and air can circulate to supply the needs of a functioning root system.

Clovers have been called natural soil aerators because of the profusion of big roots.

The large amount of potential humus supplied by the legume is also helpful in creating the ideal granulated sponge structure in the soil. Legume residues are relatively rich in nitrogen even after the plant matures. Vetch straw may contain twice the amount of nitrogen of grain straw.

In the growth stage, at which stage it is desirable to harvest the crop for hay, such legumes as clover and alfalfa may contain more than four times as much nitrogen as grain straw. These high nitrogen materials furnished by the legumes are needed to balance the low nitrogen materials such as straw and cornstalks for making humus.

To grow the most desirable legumes successfully requires deep, well drained, aerated soils well supplied with nutrients and about neutral in reaction. A big argument for liming the soil is to prepare for some valuable legume such as clover or alfalfa.

Both the legume and the bacteria that produce the nodules on the roots and fix the nitrogen do best in soil well supplied with calcium, the element which lime produces. Four tons of alfalfa, not an unreasonable yield for one season, would remove calcium equivalent to 400 pounds or more of pure lime rock.

Alfalfa grown for five years at this rate would deplete the soil of lime to require a replacement of one ton per acre. What is just as important is that the nodule-forming bacteria do not live long in acid soils and inoculation is likely to be poor until the acidity is corrected.

Even artificial inoculation may prove ineffective in acid soils. Some species of legumes do stand a moderate amount of acidity. Vetch can sometimes be grown where clover fails, and common clover may succeed where alfalfa fails without liming.

Legumes also have a high phosphorus requirement. Alfalfa may contain five times as much phosphorus in the same amount of growth, compared to redtop, a grass adjusted to poor acid soils.

Legumes likewise have a high sulphur requirement, more than three times as much as oats.

Potassium used by red clover is high, two or three times as great as for corn. To grow the better legumes successfully, therefore, the soil must be naturally fertile, or an adequate liming and fertilizer program must be provided.

This high nutrient requirement is one of the virtues of legumes. The grower knows that he must adopt good soil improving practices, perhaps better than he has ever done before if he is to succeed with such aristocrates among the legumes as alfalfa.

Good farming done to grow alfalfa carries over and improves production of other crops that follow. Burgess states that there is no better place to grow choice lettuce than to start with a vigorous alfalfa sod. Other crops than lettuce do well after alfalfa.

Whiting of Illinois has shown that a sweet clover crop plowed under may contribute more than enough nitrogen, sulphur, calcium, and magnesium, in its tissue to produce 100 bushels of corn an acre. After a clover sod is known to be a good place to plant corn for big yields. Nutrients in the clover plowed down are estimated to be nearly 90 per cent available for growing the crop that follows.

Legumes are frequently grown in a mixture with nonlegumes,

such as vetch and grain for a cover crop or grass and clover for hay or pasture. The mixture of legume and nonlegume is advantageous to the nonlegume in that the legume supplies nitrogen which the nonlegume may use.

Some have claimed also that the legume fixes more nitrogen in the mixtures, because the nonlegume uses large quantities of nitrogen, thereby creating a greater nitrogen deficit in the soil and making it necessary for the legume to get more nitrogen from the air.

When the legume and grass mixtures are used, the fertilizer program adopted may determine which of the combination gains the advantage. To encourage the clover in a clover-grass mixture, use lime, phosphate, landplaster, and potash fertilizers adequately but go lightly or leave off entirely the nitrogen fertilizers.

To give the grass the advantage and discourage the legume, use nitrogen fertilizers liberally but exercise restraint in the use of mineral fertilizers.

Many soils are too acid for clover or alfalfa to thrive without liming. An application of two tons an acre or its equivalent in neutralizing value of limestone is needed on strongly acid soils.

If the lime can be applied to a cultivated crop which precedes the legume, that is desirable. This advance liming gives a chance for the lime to become mixed with the soil by tillage, and to react to neutralize the acidity.

Many soils need an application of superphosphate to supply phosphorus and sulphur. A 500-pound-an-acre application of 20 per cent superphosphate is good and will furnish both sulphur and phosphorus. Or 225 pounds of treble superphosphate and 100 to 200 pounds of landplaster will provide both phosphorus and sulphur.

These applications should be made annually as a top dressing on the legume. When used separately, the phosphate is best applied in the fall and the landplaster in early spring.

Boron deficiency which sometimes occurs, especially for alfalfa, can be corrected by a broadcast application of 20 to 30 pounds an acre of borax in early spring. Alfalfa and clover are fairly high in boron content. Alfalfa shows boron deficiency by stunted growth and a yellowing of the foliage.

Since legumes have so many virtues, it is surprising sometimes that the acreage is not larger. Crops which bring a good cash income are likely to be popular unless there is some drawback to their production. Legumes are not always quickly convertible to cash and there is some difficulty and expense in growing the more desirable ones on any but the best

soils. But legumes for feed and seed are generally profitable.

As a feed, legumes furnish minerals for bone, and protein for growth, a very desirable type of forage for producing livestock. Legumes may furnish the minor elements that animals need for adequate nutrition. White clover carries more cobalt than does oats. Clover and alfalfa carry more copper than is found in redtop.

Legumes have been reported to be good sources of iodine, a common forage deficiency in some areas. Legumes are relatively rich in manganese, also important in animal nutrition.

There is no treatment that is superior to a vigorous growth of a suitable legume for putting new life into an old soil. Some legumes such as sweet clover and vetch will thrive on poor soils if adequately limed, fertilized, and the seed is inoculated.

Any soil suitable for cropping is likely to be capable of producing a properly selected legume, which will utilize the abundant and free nitrogen of the air, to make feed or seed and soil improvement. Legumes have been described as a means of providing a nitrogen factory on every farm. We need more legumes to enrich the soil and thereby cause other crops to make better yields and bigger profits.

Drinking Habits of Cows

Tests at Iowa State College have shown that dairy cows will drink water, if it is available to them, on an average of ten times every twenty-four hours, two-thirds of the quantity being consumed in the daytime. Their intake is about 18 per cent more than if watered twice a day at an outside tank, and their production of milk if allowed all the water they want when they want it, is increased by between 3 and 4 per cent, with butterfat increase amounting to 10 per cent more.

Cows won't do their best when they have to go to an outside tank to drink, so many dairymen who have not had water systems and drinking bowls in their barns are installing these improvements, figuring that the drinking bowls within the cow's easy reach are a profitable investment in view of the increased production of milk and butterfat and also of more convenience and time-saving for the caretaker.

Would You Sell Your Heifers?

Condensed from The Herd Builder

Leland W. Lamb

DAIRY cattle breeders are continually tempted to sell their heifers before they freshen. Many breeders yield to this temptation because they are flattered by this "demand" for their stock. We feel very definitely, however, that any man who raises heifers should consider carefully the following points before he yields to any temptation to sell them.

It cost money to raise heifers. Every day of her life, until she drops her first calf, every heifer is accumulating an ever-mounting expense account against herself. Her first calf is her first—and up to that time—her only contribution toward repayment of that bill that has accumulated against her.

Yet, if she is the right kind of a heifer she is considered to increase in value every day of her life until the time she has passed her peak of usefulness.

From a breeding standpoint, however, it is the genetic make-up of any heifer which determines her value. Her genetic make-up does not change with the years. It would seem, therefore, that the high point in any female bovine's value should be reached when she has first demonstrated her fertility —as soon as she is first pronounced pregnant. At that time she has her entire breeding life ahead of her.

Valuations are placed on many cows in accordance with their production records. We submit, however, that high producing cows are many times more plentiful than great transmitting cows. If a heifer has the right kind of a progeny proved pedigree—high index proved sire; dam, a high producing daughter of a high index proved sire; and granddam of a high producing daughter of another high index proved sire,— in other words if her pedigree makes her a candidate for Fourth or Fifth Order in American Dairy Cattle Club — her producing ability is practically assured. All such a heifer usually needs, after freshening, is the raw materials out of which to make milk. She will usually do the rest. Heifers with such pedigrees are good property—both for their breeders, and for prospective purchasers. Such heifers are the most dependable animals in any herd from the standpoint of their ability to

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Ithaca, New York, June, 1950

transmit high production to their own offspring. If they are sired by the right kind of a bull, or bulls, they represent just one more generation of progeny test breeding than their dams. Thus they should be more dependable, as breeding animals than their own dams. Otherwise there would be no point in trying to replace questionable or actually low production characteristics with high production characteristics through the use of high powered bulls.

Since a little heifer calf represents the same genetic make-up as she will represent at any time later in her life she should be *worth* just as much at that time as at any later time. Custom decrees, however, that her value shall increase, at least until the time of her first freshening. This custom, no doubt, has arisen from the very fact of the cost of raising her. Also, it is probably a "hang over" from the days of evaluating any bovine animal on the basis of body weight. The butcher has always paid, and probably always will pay for the animals he buys on the basis of their body weight. It is very doubtful that there is any correlation, whatsoever, between body weight in a dairy cow and her value as a breeding animal. So it seems ridiculous to evaluate dairy cows or heifers on that basis.

All of this does not deny the fact, however, that a group of dairy heifers, if properly fed, constitute a huge expense item on any dairy farm.

If a heifer is sold before she first freshens her owner must deduct her entire cost of raising from her sale price to determine what profit, if any, he has made as a result of having raised her up to that time.

A heifer's first calf is her first installment paid to her owner toward the feed bill she has accumulated during the previous two years, more or less. If the calf is a heifer, and if it is sired by the right kind of a bull it will probably grow into a more valuable milk producer than its dam. Yet many farmers still make a practice of vealing their heifers' first heifer calves! They have a notion that a heifer's first calf is not worth raising. How such a silly notion ever became so widespread is one of the mysteries of the dairy world.

The right sort of a heifer will produce enough milk during her first lactation to pay the cost of producing that milk plus the cost of raising her. At least, should the value of her milk be not enough to completely pay her raising bill, the total value of her first year's milk plus the value of her calf will usually put her in the clear. If she should be sold *after* one full lactation period, therefore, the price received for her will usually be clear profit. There is a vast differ-

ence between selling a $300 heifer with a $250 feed bill as a mortgage against her, and in selling that same $300 heifer *after* she has paid the mortgage!

From a cold financial standpoint, therefore, if one is to sell heifers he should sell them as baby calves, before they have accumulated a large feed bill which must be deducted from their sales price.

The recent growth of artificial breeding in this country has completely changed the picture with respect to the value of proved bulls, which must necessarily be at least five years old by the time they are proved, and therefore considered "old." Only a few years ago a proved bull was the most unwanted bovine creature in the world. Now, however, every artificial breeding association theoretically would like to use (but few do) only proved bulls.

In spite of the fact that some artificial breeding associations now claim that they prefer to prove their own bulls, we have failed to detect any diminution of interest in proved bulls of the right sort.

Any dairy farmer, therefore, who will keep his herd on DHIA test, and who will raise all the daughters of his bull has the opportunity to prove that bull. No bull can be properly proved, however, unless his daughters *and* their dams make their records in the same herd. Or, if the daughters are in more than one herd, any daughter *and* her dam should be in the same herd. When one appreciates the tremendous influence of environment on production, and especially when he understands the great differences in environmental conditions *between* herds, he must necessarily conclude that it is a mistake to include, in any bull's proof, the records of any daughter and her dam unless both made their records in the same herd.

Therefore, if you would prove a bull, and have the proof tell you whether you should continue his use in your own herd, or if you would sell your proved bull to anyone else, he should have a minimum of *ten daughter-dam comparisons preferably on the first ten daughters to be born.*

Such a proof can never be obtained after one single daughter among the first ten or twelve has been sold. It follows, then, that if you would prove a bull, you should never sell any of the first ten or twelve daughters to be born. If a dairyman's heifers today are the first crop of daughters from a bull which he hopes to prove, he is honor bound to keep them through at least one lactation each.

If heifers *must* be sold that is another matter. In such cases only those which are not sired by a bull being proved should be offered. If others must be sold, one should select only those, sired by a bull

being proved, that are *younger* than the first ten. Otherwise how can a man *ever* say that his bull has been proved on the basis of his first (whatever the number may be) *unselected* daughters? As soon as *one* is sold out of a group, the rest are selected.

In spite of the increase in artificial breeding the number of bulls proved in natural service is increasing. Artificial breeding associations are going to become more and more critical of the proved sires they buy. They will have to do so. They will be able to afford to do so. It follows, therefore, that if you would prove your bulls you will be expected to raise at least the first ten or twelve of his daughters and to milk them through at least one *complete* lactation.

After a sufficient number of daughters of your bull have been raised (we say at least ten, and preferably twelve) to give him a reliable proof, there need then be no restrictions on selling the younger daughters if one can't resist the temptation to let someone else raise them.

If, as is so often the case in a healthy herd, a dairy farmer finds himself in the position of owning more animals than he can house properly, or feed properly, he must reduce the herd to proper size. It then becomes a matter of choosing which animals to sell.

In considering this situation one should always keep in mind certain facts. One of these is: If the sire of your heifers has been properly selected his daughters *should* develop into better cows than their dams. It might be good business, therefore, in choosing between the dams and the daughters, to choose to keep the daughters!

Certainly the first animals to feel the reduction axe should be any old, damaged, or low producing cows. Certain of them should go for beef, or bologna, as the case may be. Others might be valuable to a beginner for foundation purposes. Many a good herd has been built from a foundation of old, damaged cows.

There is always a certain appeal to a handsome, well grown heifer —especially if she is close to freshening. She hasn't been worn weary with the exacting toil of heavy milk production. She has never *shown* mastitis, although she might freshen with it. She is apt to exhibit a certain youthful, glamorous charm that makes the buyers want her. Probably, if sold today, such a heifer would bring as much as, or more than, she would two or three years hence. That same youthful charm that makes her attractive to a buyer may make her a good bet to keep.

A good, healthy young cow, just fresh or due soon, will usually bring a good price. This is especially true if she has been properly

fitted for freshening. Such a cow, honestly presented helps to build a market for those to come after her. Conversely, the same cow, if 'inflated' in the sales ring, or if sold in the middle of a lactation will probably help to destroy her owner's future market. Certainly, if sold in the middle of a lactation she will bring only a fraction of what she would have brought had she been sold just before, or just after, calving.

No one can maintain a breeding herd and sell many females before they have had a chance to leave female offspring to take their places after they are gone. Realizing this fact many breeders resolutely refuse to sell any female until she has one or more daughters coming along in the herd.

It is very difficult for any breeder to learn anything about the breeding value of his different cows unless he raises their daughters. A perfectly understandable desire to get this information on his cows prompts many a dairy cattle breeder to keep a collection of old skates—an "old ladies' home" some call it—just for the sake of getting their calves. Such a practice may be all right for the "hobby" farmer but it is difficult to justify on a farm where it "takes the milk check to make the mare go."

Furthermore, if a sound breeding program has been followed, the daughters of these old cripples should drop better calves than they, themselves, can produce. Rare, indeed, is the cow whose keep can be justified after her days of profitable milk production are over.

One way to reduce your herd, and still maintain its continuity as a breeding unit is to sell those old cows that are already represented in the herd by one or more daughters. Some may have to go for beef. Others may go for breeding purposes. In any event they should not stay in the herd and deny room and feed to other younger, and certainly more profitable cows.

One of the most successful breeders in this writer's acquaintance is a man who raises all his heifer calves every year. Every second or third year he holds a dispersal and sells all his milkers. The result is a herd of young cows at all times. No cow grows too old to sell for a good price. He keeps the continuity of his herd intact, and yet he seldom accumulates more animals than he can feed and care for adequately.

The dairy cow is the only animal with which a farmer can "eat his cake and keep it too." He can sell her milk for several years; replace her with her daughters; and after her profitable days are over he can sell her for something for beef.

The beef raiser can only sell the calves from his cows. In all prob-

ability she will not have any more calves than a dairy cow, before she fails to breed regularly. Then she too must go to the butcher.

Almost every careful dairy farmer will find himself faced sooner or later with the problem of either increasing the size of his milking herd or of selling a sufficient number of animals to reduce the size of the herd to fit either feed supplies or housing facilities. When such a time comes it seems to us that he should sell cows that have already repaid him for their cost of raising and that have left him one or more daughters with which to carry on in the future. Seldom should he sell his heifers.

How to Grow Better Alfalfa

Condensed from New Jersey Farm and Garden

Dr. Gilbert H. Ahlgren and Alexander Dotzenko
Rutgers University

In 1850 less than 100 acres of alfalfa were grown in the United States. One hundred years later over 15 million acres of this wonderful, protein-rich legume can be found.

In New Jersey the acreage has increased from about 200 in 1900 to over 75,000 in 1950. Delaware had 4,000 acres in 1924, today produces 7,000 acres.

Although more and more alfalfa is being grown, there are many attendant problems in its culture. It is becoming increasingly difficult to maintain good stands for more than two to five years. This loss of stand is due to many factors like disease and insect damage, winter-killing, malnutrition, mismanagement, and lack of seed of adapted varieties.

Alfalfa has been studied by many capable men since it was first planted here in 1784. The N. J. Experiment Station began investigations on alfalfa shortly after the station was established in 1880. As the crop grew in stature along with our livestock industry, certain important facts about it have been discovered.

Repeated tests have shown that it is best adapted to well-drained, fertile soils. The soil pH is best if it is between 6.0 and 6.5 and this is most readily attained by adding lime. Seed inoculation every time a planting is made is wise insurance for successful nodulation, and the cost is insignificant.

There is evidence that much of our alfalfa dies from an inadequate feeding program. At seeding time from 500 to 1,000 pounds of a 5-10-10 fertilizer per acre are needed. The small amount of nitrogen carried by this fertilizer

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Sea Isle City, N. J., March, 1950

gets the seedling plants off to a vigorous start and the phosphate and potash sustain them.

Trace elements are becoming more significant each year. It now has been established that many of our soils are deficient in boron—but this problem is easy to correct. On light soils 10 pounds and for heavy soils 20 pounds per acre of borax each year will solve the problem. Other trace elements, notably molybdenum, also may be necessary but research on this is scarcely out of the laboratory phase.

Alfalfa is a heavy feeder on plant nutrients. Three tons of hay per acre will remove the equivalent of 1,000 pounds of an 0-5-12 fertilizer. Our experience is pointing toward top-dressing treatments following each hay cutting. This reduces luxury consumption by the first cutting, and makes plant food available for each successive hay crop harvested.

Applying the equivalent of 300 pounds of an 0-20-20 fertilizer after the first, again following the second, and finally the third cutting will provide the nutrients at the time they are needed. The fall treatment following the last cutting will give the needed plant food to help alfalfa survive the hazards of winter and stimulate good early spring growth. No early spring application is needed under such a feeding program.

There is no complete answer to the diseases so prevalent on this crop. Elimination of spring feeding will help in the control of sclerotinia or crown rot. Growing a grass companion with alfalfa may reduce leaf spot somewhat. Varieties resistant to wilt and certain unknown diseases help in maintaining the stand. The best varieties to date are **Atlantic** and **Buffalo.** Some seed of both is available for slightly more than common seed costs.

The search for adequate insect control measures is underway. Of the insects, the leafhopper is probably the most destructive.

Recent work has shown that alfalfa may be cut as early as the half-bloom stage without reducing the stand. Cutting each crop at this stage enhances the opportunity to make three harvests a year and possibly improves quality.

Harvesting after the middle of September is hazardous. Alfalfa must have a period to "harden off" and store starch root reserves. At least six inches of top growth must be attained before the first hard frost. After this, the frozen tops may be grazed for additional pasture if desired.

Success in growing alfalfa, then, depends on many factors. Good soil, adequate feeding, the use of superior varieties and grass partners, and judicious cutting treatments help prolong productive life of each field.

Vacuum Lines Need Cleaning

Condensed from Electricity on the Farm

I. E. Parkin
Dairy Specialist, Pennsylvania State College

MANY milking machines are not operating properly because the vacuum lines are partially clogged. Such material as bedding, soiled and otherwise, hair, rust, milk, scale, dust from feed, lime and super-phosphate may be sucked into the vacuum line during the routine of milking. If this contamination were removed, many milking machine problems would be solved.

To keep your vacuum lines in proper shape, they should be cleaned at least four times each year. Of course the line should be cleaned immediately if milk has been sucked in. Here is the proper way to clean and flush the vacuum line.

Step 1. If your machine has a magnetic unit, remove the pulso magnet from the end of the stanchion hose.

Step 2. Pour hot water into a pail. The amount should not exceed two-thirds of the capacity of the sanitary trap on your milker. Add to this a small quantity of a wetting agent or a good dairy washing powder or liquid. Mix it thoroughly.

Step 3. With the milking machine pump operating, suck this washing solution through the stanchion hose into the far end of each vacuum line.

Step 4. Shut the machine off and remove the sanitary trap from the line. On some machines the sanitary trap, in the form of a tank, is located below the motor and pump. Remove the drain plug to draw out the washing solution.

Step 5. Dispose of the washing solution. Discard it outside your barn.

Step 6. Return the sanitary trap to the line.

Step 7. Mix a lye solution: one can of lye dissolved in hot water in an amount not to exceed two-thirds of the sanitary trap capacity. CAUTION: Use lye with care. It can burn the skin.

Step 8. Start the milking machine pump and suck the lye through the stanchion hose at the stall cock nearest the vacuum pump.

Step 9. Shut off the milking machine and remove the sanitary trap. Pour the lye solution back into the pail. Replace the sanitary trap in the line, start the pump

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again and repeat the process at the next stall cock. Continue this step until the lye solution has been drawn through each stall cock on the system.

Step 10. Dispose of the lye solution outside the barn. Do not pour it into the gutter.

Step 11. Pour clean, hot water into a pail in an amount not to exceed two-thirds of the capacity of the sanitary trap. This is sufficient to flush four stall cocks.

Step 12. With the milking machine pump running, start at the stall cock nearest to the vacuum pump and proceed out toward the end of the line. Draw one-fourth of the clear hot water into each of the first four stall-cocks. Shut off the pump, remove the sanitary trap and dispose of this water. Then replace the sanitary trap in the line and with fresh hot water, flush the next four stall-cocks, repeating the process until all the line has been flushed.

Step 13. When the complete system has been flushed, leave the sanitary trap down and open all stall cocks so that air may circulate through the line to dry the system.

Contamination of the vacuum line may be reduced by observing several good practices while milking.

Do not raise dust in the barn by feeding, bedding, or sweeping before or during the operation of the milking machine.

Attach machines to properly prepared, cleaned udders only. As you attach the teat cups, do not allow bedding to be sucked into the machine.

Do not suck milky rinse water into the line.

Do not use leaky inflations. Use only good clean sound milking machine rubber parts.

Do not fill the milking machine pails more than two-thirds full. Make sure that they are set so that they will not get tipped over.

Put relief valves at the end of the vacuum lines to prevent rust and scale caused by condensation.

Good equipment must be handled properly, if it is to do a good job.

A Good Way to Market Calves

Condensed from Successful Farming

Grant Salisbury
Michigan State College

IN the northeastern corner of Michigan, just above Saginaw Bay, a group of farmers have proved you can take the proper natural resources and, with vision, planning, and group action, produce and market a quality product. In the story of the Northeastern Michigan Hereford Calf Association, there are ideas for individual farmers and groups of farmers everywhere.

Members of the association live in the 5-county area of Alcona, Oscoda, Iosco, Ogemaw, and Arenac. In this part of Michigan, where lumbering fortunes were made and "cutover" land was left behind, high-quality Hereford feeder calves are produced from abundant supplies of grass. These calves are marketed once each year through the association's own saleyards in West Branch. Take a look at this record from the 1949 sale held on October 18:

Eight hundred and eighty head sold for an average price of $26.64 per hundredweight. Three hundred and ninety steer calves, averaging just under 400 pounds, were sold for an average of $30.91 per hundredweight. Two hundred and sixty heifer calves, averaging 370 pounds, brought $26.87 per hundredweight. One hundred and fifty-one yearling steers, averaging 741 pounds, brought $22.45, and 79 yearling heifers, averaging 580 pounds, went for $21.65 per hundredweight.

It was in 1939 that C. T. Prescott and some 20 interested farmers and county agents got together and formed the Northeastern Michigan Hereford Calf Association.

The first years of the organization were spent in promoting interest in the project and educating members in some of the fine points of handling a beef cow herd to produce quality feeder calves. By 1945 the association was ready to crack its marketing problem.

If you'll look at a map of Michigan you can see that the area above Saginaw Bay is around 200 miles from the nearest terminal market in Detroit. However, there are plenty of experienced cattle feeders in the grain-producing areas of southern Michigan. In fact, more than 100,000 feeder

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Des Moines, Iowa, May, 1950

cattle come into this area each year—most off the Western ranges.

It has taken cooperation in the right places to make this project successful. Local support has come from the West Branch Chamber of Commerce and others in the area, without whose aid it would have been tough to build the sale-yards. Enthusiastic support has come also from the Michigan Department of Agriculture, which contributes from its advertising funds to promote this sale of Michigan-grown feeder calves. The state Agricultural Extension Service has lent its manpower for such jobs as supervising the weighing and sorting of animals. And several Michigan meat packers contributed toward building the yards.

In 1946 the farm management specialists at Michigan State College set up a cooperative study of beef cattle management on some 20 farms owned by association members. Now the records are kept each year and have been a valuable guide to all concerned.

The members themselves are loyal to their organization. Many of them have offers each year to "contract" their calves, but they refuse to sell outside the annual auction. They don't regret it.

It costs members a dollar per head for each animal consigned and a 2½-percent commission. The fee per head is used mainly for advertising, and the money collected from the sale commission goes to pay off the balance on the yards and keep them up.

As to other mechanics of the sale, it's been shown year after year that there is no shrink in weight of the animals from the day they enter the yards until they are sold. In fact, they usually show a little gain in weight. They are weighed off the trucks into the yards without feed or water, and that is the sale weight. They get hay and water in the yards.

Trucking facilities are available at the yards for buyers. Any buyer in southern Michigan can have the animals in his own feedlot within 4 to 6 hours after sale time, ready to go to work for him.

To show how cows and calves are produced in this area, take the farm of Harold and Howard Hodgins. These two brothers have converted their place from a dairy enterprise to one which carries a profitable beef cow herd, and it has paid its way.

The Hodgins brothers own 290 acres, with 150 tillable. The rest is in woodland or cutover land. They rent another 80 acres across the road, all of which can be cultivated. This total acreage has carried a herd of 40 beef cows, and this year they have gone to a 50-cow herd. They cleared 10 more acres of cutover land last year.

Their long-range program calls for clearing 10 acres each year in order to increase carrying capacity

and better their setup for producing legume seed, one of the balance wheels of their farming. Another balance is the growing of wheat and barley as cash crops.

The uniformity of their calves is remarkable. That's because they handle the cows to keep them in good reproductive health and keep two active bulls to cover the herd at breeding time. Each year, 90 percent of the calves are dropped within 30 days. Up until now, April has been calving time, but this year it was March. That way, they figure on having 50 more pounds on each calf by sale time.

The Hodgins brothers know how to use the figures which come from the farm-management record project. They can tell you the average net return per cow on their farm; it was $66.12 in 1948. They know how much feed went into each cow and each calf. And the records tell them what they need to know about the cost of keeping a bull.

First cutting from the "tame" pasture is used for hay each year. The average hay yield is 2 tons per acre, and it often runs as high as 3. Then pasture is handled so there is enough in the dry season.

A hay and pasture mixture of brome, alfalfa, and June clover is used. The first year after planting, June clover seed is harvested. Just before sale time last year, they took 18 bushels of cleaned seed from a 10-acre field. It was worth $21 per bushel. The second year a crop of alfalfa seed is harvested. The hay and pasture fields are left for three years.

Fertilizer goes on the cutover land to make the native grasses highly productive. Anywhere from 300 to 500 pounds of 0-20-20 per acre, every other year, will make the grass flourish between the old pine stumps. It will carry a cow and calf per acre except in the dry season. Fertilizer makes the grass come on earlier, stay later, and come back more quickly after drouth.

Harold and Howard Hodgins feed grain in a creep to insure bigger calves at sale time. This also insures the buyer that the calves are ready to eat grain when he gets them home. In fact, all calves at the annual sale have been weaned one or two weeks before sale time and taught to eat grain.

The success of the Northeastern Michigan Hereford Calf Association encouraged beef men in the counties farther north and west to form the Northern Michigan Beef Breeders' Association in 1946. It sells annually at its own yards in Gaylord and gets the same cooperation from the extension livestock men at the college. This year they sold 607 feeders of three breeds—Hereford, Angus, and Shorthorn. The average price was $25.36 per hundredweight.

And that's the story of how a group of farmers with foresight

used group action and natural resources to produce a quality product and get it to a market where it is in good demand.

Udder Treatments and Milk Let-down

Condensed from Ohio Farm and Home Research

C. E. Knoop and C. F. Monroe

To milk cows rapidly and completely dry by either hand or machine requires proper treatment of the cow at all times. Certain methods of treating cows may seem to be right but may not be fully acceptable to the cow, especially at milking time. Tests at the Ohio Experiment Station have shown that massaging the udder of the cow from 10- to 15-seconds with a wet towel in the cleaning process may save up to one minute per cow in milking time. The time is saved by the prestimulation of milk let-down that would be caused by the milking machine under normal, no treatment conditions.

Udder Treatments

In the tests, two groups of cows were used. The first group of cows received five different treatments of the udders; each treatment was studied for a period of 8 days. The treatments were as follows:

(1) No treatment or the control.

(2) Brushing or rubbing the udder with a dry hand for 10- to 15-seconds to remove the loose dirt.

(3) Cleaning the udder with a cool, damp towel for a period of 10- to 15-seconds. All towels had been previously boiled and wrung from water and stored in a dry bucket until used.

(4) Cleaning the udders with heavy towels wrung from hot (120° F.) water.

(5) Cleaning the udders with heavy towels wrung from hot (120° F.) water followed by removing one or two streams of milk from each teat with the strip cup.

Milk Let-down

The reaction of the cows or the rapidity of let-down of milk was measured by a specially equipped milking machine and a stop watch. The amount of milk obtained in the first 45 seconds of milking was compared with the amount obtained during the second 45 seconds of milking. During the second 45 seconds the quantity of milk obtained was the same for all treatments, varying

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from 4.1 to 4.2 pounds. This indicates that regular milk flow had been reached after 45 seconds of milking time, regardless of treatment.

However, during the first 45 seconds of milking time, the comparison of the amounts of milk received show that gently cleaning the udders one minute before milking with a wet towel taken from a dry bucket or wrung from hot water stimulated the rapid let-down of milk. Temperature of the wet towels or use of a strip cup appeared to be unimportant.

The results of the first trial, emphasized the fact that the milking act without any pre-milking treatment, becomes the stimulant for milk let-down. In addition, this work also showed that gently cleaning the udders with wet towels before milking stimulated the rapid let-down of milk. This information resulted in two questions:

(1) Will removing one or two streams of milk from each teat (strip cup) be sufficient stimulation for rapid let-down of milk? and

(2) Is bathing udders with hot water superior to the use of wet towels wrung from hot water?

Four Treatments

A second trial was undertaken to test the efficiency of these udder treatments. Four treatments were used: (1) No treatment or control. (2) Use of strip cup—removing 1 or 2 streams of milk from each teat. (3) Cleaning udders with a heavy towel wrung from hot water (120° F.) followed by the use of a strip cup. (4) Same as 3 except that the water was allowed to stay in the towel so that this treatment amounted to almost bathing the udder with hot water. This again demonstrated that proper treatment of the udder one minute before milking is necessary for the rapid let-down of milk.

The milk production of the cows was not influenced by any of the four treatments. The only difference was in the milking time. Compared to the control or no treatment, the use of the towels wrung from hot water and followed by the use of the strip cup shortened milking time 54 seconds. The use of the udder bath and strip cup shortened the time only 34 seconds. However, cows appeared uneasy when receiving an udder bath with hot (120° F.) water which may account for the slight lengthening of the milking time with that treatment. Use of the strip cup alone reduced milking time by only 18 seconds.

These experiments indicate that for the average milking operation it will save considerable time over the long period to pre-stimulate milk let-down. Four practices are suggested to aid in the effi-

ciency and completeness of the milking operation.

(1) Proper stimulation for cows to let-down milk before attaching a milking machine by: a) Observing regular hours and procedures in milking. b) Spending from 10- to 15-seconds in cleaning the teats and udder with a towel removed from clean, warm water. c) Removing one or two streams of milk from each teat into a strip cup.

(2) Allow one but no more than two minutes to elapse between massaging the udder and attaching the milking machine.

(3) Remove teat cups when milk flow stops. As all quarters may not milk out in the same length of time, teat cups may have to be removed individually. Damage may be done to the teats and lower part of the udder by leaving the machines on after the milk flow has stopped.

(4) Milk cows dry. Generally this can be accomplished with the machine. Certain cows may require hand stripping.

Ways to Reduce Your Electric Bill

Condensed from Capper's Farmer

F. W. Andrew
University of Illinois

ELECTRICITY has gained the reputation of being the world's most efficient hired hand. No other source of power will do so many things. And it's cheap. But the bill can mount up. A big bill doesn't always mean lots of work for the money. Too much of it may be waste. Just because an electric motor will do a job for a cent an hour—and can replace a man at that wage—doesn't always mean that the current is wisely spent.

So let's make a trip around your farm and see how many ways we can find to lower your power bill. First take a look at the main entrance equipment. Is it located near the center of the distribution system, such as a modern meter pole or other approved installation, or is it off to one side?

Is your wiring the right size to meet your electrical needs? Or are you using the same old harness on a new team hitched to a bigger load? Are the lines from the main entrance to building service installations too long? Is the wiring big enough to deliver the power required?

The meter is an impartial device. It measures only what goes thru it. You pay the bill, whether the kilowatt-hours get to the end

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Topeka, Kansas, October, 1950

of the line or hop off along the way; whether they're spent in heating a small conductor or in shorting out of faulty wiring.

Got any long-run extension cords around? Maybe 100 feet or so operating a 1,000-watt brooder? That sort of makeshift can lose enough current in 1 season to pay a big part of installing No. 8 weatherproof copper conductor, poles and insulators. And didn't you chill some chicks because the brooder didn't deliver enough heat? There's another place to save money for a permanent line.

Sure, your overhead wire's weatherproof. But isn't the insulation scraped off there where it rubbed against the windmill tower? Ever notice sometimes when it's raining that the main switch box is a little "hot"? It's probably because that wire is partially grounded to the windmill tower. Goodness knows how many kilowatt-hours have been draining off into the earth.

The yard light probably is one of the most convenient lights around the place if it has enough switches. But you need at least 1 at the house and 1 at the barn. Otherwise the light may be on a lot of the time when it is not needed. Perhaps you should install some modern multiple or remote-control switches so you could turn your yard light on and off from several places. Low-voltage conductors and simple switches will enable you to have light when and where you need it. Cost will go down because the light will be handy to turn off.

Electricity is a wonderful means for keeping stock water from freezing. It will do the job automatically. Power consumption for heating an open tank can be cut in half by banking it with 6 or 8 inches of straw and putting on a wooden lid. Leave only a nose hole open. Better still, change to automatically heated drinking cups. Be sure the water heater is properly grounded. Then, if the insulation should break down, it will blow out the fuse and let you know that something is wrong instead of letting the current seep away. The loss of current costs money. It might cost you your life or kill an animal.

Check the water system. Has the pump been running a lot lately? Are the leathers worn? An improperly adjusted jet pump can do a lot of running for the amount of water it delivers. A shallow-well turbine pump may have its impeller so worn from particles of sand that the finely machined blades cannot build up a pressure without running extra time.

Take a grease gun, oilcan, wrench, screw driver, whisk broom and a few rags along when you go looking for power leaks. Dust on the motor, fan, condens-

er, compressor of a milk cooler, refrigerator or food freezer will make overtime work.

Clean blades of attic, dairy barn, poultry or hog house ventilating fans. They can't move air efficiently if the design is changed by thick layers of dust and grease. No use spending money for churning air. You want to move it.

Improper alignment and lack of lubrication can make a corn elevator take twice as much power. Friction accounts for half the current required to operate a barn cleaner. Lubricating chains and sprockets regularly and keeping moving parts adjusted will lengthen life of equipment and reduce power required.

Check belt tensions and pulley alignments on all motor-driven equipment. Slipping belts waste power, belts that are too tight can overheat bearings.

There's that dripping faucet. Every drop of water wasted must be pumped. If it's hot water, it wastes heat. A new washer will stop the loss.

Pipe from water heater outlets should be as small as possible to give the flow required. Remember the cold water that comes out of the hot water faucet was once heated. The more you have to drain off, the more money you have spent for electricity without benefit. Locate the heater as close as possible to the faucet where most of the hot water will be delivered. In most cases this is at the kitchen sink. Make the connection with either ⅜- or ½-inch copper tubing.

Sometimes the electric heater is installed to recirculate water thru the old range boiler, the furnace coil, and even the furnace itself. That's not a recommended way of heating your home electrically! You can increase heater efficiency, reduce radiation losses, and increase the life of the tank by setting the thermostat properly. Between 140° to 160° is reasonable.

In range and water heater combinations, a peak limiter may save money. This device automatically shuts off the water heater while you are cooking and thus reduces the demand on the generating equipment so that the power company can afford to give you a more favorable rate. Some companies use time switches and separate meters for off-peak water heating.

The electric range is satisfactory and economical. But it can be wastefully operated. Save money by using pans with smooth bottoms that cover the heating units. In boiling foods turn the unit to a lower temperature as soon as the boiling point is reached. Turn off the burner when food is nearly done and finish cooking on stored heat.

Make a habit of turning off lights, radio, fan and other elec-

trical equipment when not in use. A warning switch with red light at the stair door will help to keep the basement and attic lights from burning needlessly.

Sometimes the basement sump pump is overworked because an attempt is made to keep the water table too far below the floor. The float should be adjusted so the pump will turn on when the level comes within a few inches of the floor and turn off when the sump is empty.

Maybe you can save enough by stopping power leaks to buy that new piece of equipment.

A Permanent Trench Silo

Condensed from American Agriculturist

Jim Hall

JOHN D. HOLOPAINEN, of Hubbardston, Massachusetts, wanted storage space for his grass silage designed so that one man could fill it without manual labor. From material they read and visits to other farms he and his son reached the conclusion that it was a trench silo they needed but that it had to be permanent. They didn't want to dig the silage out from under snow, and they didn't want to have to rebuild the sides and bottom after spring rains.

Choosing a site at the base of a sloping field about 70 yards from the barn, they went to work in the stony soil and scooped out their trench with a rented bulldozer. Because the land was so stony, they started using the stones to lay up walls two feet thick at the base. By the time they had the two 61-foot long walls built up to four feet, they knew that type of hand work would take too much time, so they changed their plans, built forms and finished the job with transit-mixed concrete to which they added equal parts of stone.

Instead of building a scaffold to work on forms, they worked from the truck platform for the lower levels and then from a platform laid across the top of the stake body. There was ample room in the trench to move the truck back and forth so that their working platform would be just where they wanted it.

From the two-foot thick footing the walls slant to an 8-inch width at the top. The concrete was poured in 30-inch layers and during the pouring each layer was secured to the next by steel re-

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Ithaca, New York, June 3, 1950

inforcing that consisted of any junk steel they could find. Weikko says that were they to do it again, they'd pour the concrete-stone mixture the entire height of the 12-foot walls and have it no thicker than 12 inches at the bottom.

The sides, floor and one end of the silo are solid concrete with the walls slanting from 13 feet apart at the base to 16 feet at the top. At the open end, nearest the barn, concrete corners were formed to support the sectional frame partitions that are put in as the silo is filled. These partitions rest against 5 by 6-inch oak timbers that span the width of the opening. Because the walls slant outward from the bottom to the top, these timbers and the partitions can be raised just a few inches and tossed out as the silage is fed.

To get better traction when taking out silage by power loader, the floors were made rough, but Weikko has found it more efficient to chop down through the silage with an ax and throw the layers of silage on a dump-trailer with a hand fork. This is the only hand labor in their silage operation and takes less than 15 minutes morning and night. The silage is dumped from the trailer into bunks at the barn.

To protect the silage from weather, the Holopainens built a sectional roof of 2 by 3-inch rafters and 1 by 3-inch strippers covered with corrugated aluminum roofing. The sections, light enough for two men to lift off, are bolted together. The materials for the roof cost $150 and the two men built it in a week. The total cost of the silo, excluding their own labor, was $974.

Weikko figures that the silo holds between 250 and 300 tons of the high moisture silage they put in, but that isn't enough for his herd of 50 so he plans to raise the walls three feet. The addition will be perpendicular in order to use the same roof, and will add about 50 tons to the capacity.

Finished in time for grass in 1948, the Holopainens filled the silo in 10 days. Weikko would start mowing, with a two-way windrower attached, in the morning while his dad finished up the chores and then, when his dad came to the field with their dump truck, Weikko would switch over to their field chopper long enough to get the truck loaded. While John was taking a load to the silo, backing up to one side and dumping it into the pit, Weikko would leave the chopper and mow some more.

A light tractor with loader attached was left in the silo from the time they started filling, and each evening Weikko would run back and forth in the trench to level the dumped in piles and at the same time pack the grass. When the fill-

ing was completed, he drove the tractor out over the side and they put the roof on. The Holopainens were one of the top 18 winners in the 1949 New England Green Pastures Contest.

Building Better Pastures

Condensed from The Michigan Farmer

Milo B. Tesar

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Good pastures don't just happen. They are well planned. They are the result of using superior species like alfalfa, bromegrass, and Ladino clover as the backbone in crop rotations. When managed like crops rather than wasteland, rotation pastures increase the yield of succeeding cash crops and insure a permanent, profitable grassland agriculture.

Moisture becomes a limiting factor in many areas during midsummer. As a result, it is necessary to use drought-resistant forage crops to maintain summer milk production or animal gains. In addition, the plants must stay palatable during mid-summer even though they are mature so that surplus growth can be harvested mechanically for later use.

The farmer who manages his livestock and pasture well will be sure that he has a surplus of pasture during the early part of the growing season. Only by using such a system is it possible to keep costly barn feeding in mid-summer to a minimum. Furthermore, such a system will lessen overgrazing, save manpower and machinery, and save hay for the winter season.

A good pasture program based on several forage crops makes it possible to graze animals for 5 to 6 months per year in Michigan. However, very few farmers make full use of improved pasture practices and suitable crop rotations to provide season-long pasturage of high quality. To many farmers improved permanent pastures are the chief source of pasture during the grazing period. Such pastures are made up mostly of Junegrass (bluegrass) with red top and other grasses on wetter areas. They make about three-fourths of their seasonal growth by July 1st and are unproductive during July and August. When a farmer depends almost entirely on such Junegrass pasture, he is likely to be short of pasture during this July and August period, or earlier

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during dry seasons. The animals may be on pasture every day during the summer but are getting very little benefit out of it. The pastures cease to be pastures—they become "exercise lots."

Many farmers hesitate to use good land for pasture. They feel it should be used entirely for cropland. Good pasture, however, will compare very favorably with productive crops in the amount of total digestible nutrients produced per acre. The greater the amount of roughage obtained from the pasture the lower will be the cost of milk production. Data collected by the United States Department of Agriculture in 16 states including Michigan show that 100 pounds of total digestible nutrients obtained from pasture cost 64 cents; from alfalfa 83 cents; from corn, $1.38; and from oats, $2.02.

Of course, one of the reasons why pasture produces the cheapest feed is that the cow does her own harvesting. A research specialist at a prominent college of agriculture has said:

"The cow was designed by the Almighty for the consumption of roughage crops. This animal is a mobile harvesting machine. equipped with a mower and grinder on one end and a fertilizer spreader on the other. In between these two extremes is located an extremely complicated manufacturing plant especially designed for the conversion of large quantities of raw materials—pasture, silage, hay—into nature's most nearly perfect food, milk."

The carefully planned pasture program allows at least one acre of pasture per cow. The basis of providing most of the good pasture in Michigan rests on a mixture of alfalfa and bromegrass, with the addition of Ladino clover to the mixture on moist, fertile land. Ladino clover added to the mixture may not increase the yield of forage but increases palatability and has a high nutritive or milk producing value. Dairymen over the state are becoming very enthusiastic about its use in an alfalfa-brome-Ladino mixture.

Alfalfa-brome provides about 120 cow days of pasture per year and what is more important, this pasturage is continuous from about May 15th to September 1st. It provides pasture during the month of August when Junegrass pastures dry up and yield little nutritious forage. It is the alfalfa which makes the alfalfa-brome mixture productive in August when other pastures dry up. Alfalfa is deep-rooted and is not so dependent on weekly rains as are some other shallow-rooted legumes or grasses. The alfalfa-brome pasture must be rested from September 1st to October 15th so that food can be stored in roots for the next year. About 15 cow days of pasture can be obtained the last

half of October to reduce the amount of barn feeding during this period.

Tests conducted at the Kellogg Station, a branch station of Michigan State College near Augusta, show that alfalfa alone produced an average acre return of 790 sheep days pasturage compared to only 412 sheep days obtained from fertilized Junegrass. Furthermore, the pasturage was continuous during the summer on the alfalfa but mostly in the early part of the season with the Junegress. In another case when grazed with Texas lambs, the lambs gained 392 pounds an acre on the alfalfa pasture compared with 179 pounds on the Junegrass. As a summary of the pasture trials, alfalfa produced livestock returns which were nearly twice as great as on well-managed, fertilized Junegrass on the same soil. Another test showed the alfalfa-brome produced more milk than alfalfa alone—3933 pounds as compared to 3606 pounds of milk per acre for the average of 3 years. The addition of bromegrass not only helps in increasing production but helps in keeping the stand productive longer since brome lives longer than alfalfa. In another case, one group of Hereford steers, with a grain ration provided in self-feeders gained 267 pounds per head while on pasture whereas another group gained 229 pounds per head while on full feed in dry lot. The cost per 100 pounds of gain for the steers on pasture was $2.60 less than for the drylot steers.

These experiments and the experience of farmers indicate that the use of alfalfa-bromegrass as the basis of a strong pasture program is sound. The alfalfa-brome is usually left in the regular crop rotation for 3 to 4 years and then followed by a crop such as corn. The yield of corn is usually increased following the use of a sod crop such as alfalfa-bromegrass. The legume (alfalfa) adds nitrogen to the soil and both the grass and legume improve soil structure.

Bromegrass and alfalfa are usually part of the regular farm rotation and are followed by a cash crop like corn. However, many farmers have a small acreage, of low, wet muck land which is not suited to a regular crop rotation but produces good reed canary grass. Reed canary grass is recommended only for muck soils —not for wet mineral soils. It produces about 200 cow days of pasturage per acre. It starts about 5 days earlier (May 10th) than most other pastures and provides abundant pasturage up to October 20th. The pasturage it produces in September is especially valuable to the farmer because most pastures are either unproductive at this time or, like alfalfa-bromegrass, should not be grazed.

Farmers who have a few acres of swampy muck land can well afford to seed it to reed canary grass after the muck is worked into a good seedbed and fertilized. Application of fertilizer containing phosphorus and potash tend to increase palatability and productiveness of the grass. Many farmers report that livestock will eat right to the line where the soil was fertilized and will then stop. Consequently, an experiment was set up at East Lansing in 1949 to test the effect of fertilization on the amount of beef gains per acre.

Reed canary grass is permanent and should be grazed so that it doesn't get over 8 to 10 inches tall. When it gets tall and stemmy livestock do not like it very well. Seeding on well-prepared fertilized muck land and keeping it grazed under 10 inches after it becomes established is probably the best way to use it for pasture. Before seeding a sample of the muck soil taken at several places in the field should be tested by your county agricultural agent or sent to your State College.

Many farmers make the mistake of seeding too large an area to reed canary grass. It is very productive and its meat or milk producing capacity is dependent on grazing while the leaves are immature and nutritious rather than coarse and mature. Therefore, it is usually better to seed 5 acres and keep it grazed under 8 to 10 inches than to have 10 acres which might grow 2 to 3 feet tall—too tall for good utilization. Cattle on reed canary grass should not be allowed to graze bluegrass, bromegrass or alfalfa pasture at the same time since they prefer the other species to reed canary grass. However, exceptionally good production of milk and beef has been reported by farmers when livestock were confined to reed canary grass which was properly fertilized and grazed.

Rye has been used to some extent by many Michigan dairymen. Seeded in August it should provide some pasturage during late September and October when rotation pastures are not grazed. It can be pastured from early April until the first part of June. Balbo rye is preferred by some farmers to common rye since it does not result in off-flavored milk as much as ordinary rye and produces more and earlier growth in the spring. Regardless of the variety, cattle should be removed from the rye pasture about 2 hours before milking to lessen flavoring of the milk.

Oats sown early in April furnish grazing from about June 1st to July 15th. They should be considered as a temporary spring pasture. Legumes and grasses seeded along with the oats may actually produce a better stand when the oats are grazed than when harvested for grain.

Junegrass pastures may often

be grazed starting about May 1st and therefore furnish an earlier source of pasturage than bromegrass and alfalfa. Alfalfa would be injured by such early grazing. The early grazing of Junegrass which tapers off during the latter part of June is about all the production that can be expected from Junegrass. Dairymen find that July and August grazing on Junegrass is unsatisfactory since the plant heads out and becomes dry, tough, and leathery. Fertilization does not help to maintain production during this dry period. However, some beef cattlemen have found that July-August grazing of older steers and brood cows on dry Junegrass pastures has produced satisfactory animal gains.

Most pastures are usually good during May, June, and the first half of July but usually there is not enough nutritious pasturage during August because of the hot dry weather. During September grasses and legumes store reserve food in their roots and should not be grazed.

Alfalfa-brome grass, sweet clover, and June clover (red clover)-timothy can all be used to furnish nearly continuous pasturage through August during most years. Of these 3 mixtures, alfalfa-bromegrass is the most reliable producer during this month because alfalfa has a deep rooting system and the bromegrass is fairly drought and heat resistant. Reed canary grass, of course, is very good during this month on low muck soils well supplied with moisture.

The use of Sudan grass in the pasture program is advisable for livestock men, especially dairymen, since it grows exceptionally well during the hot dry weather of July and August. The cost per day of Sudan grass pasturage, however, is high since it is an annual and must be seeded yearly. Dairymen value it as a pasture crop even though it is more expensive than biennial or perennial crops since it does furnish pasturage when it is needed most—in hot, dry August. It also produces very well in late July and up to the first part of October.

The difficulty of providing sufficient pasture in September is probably the weakest link in the whole pasture system. New seedlings should not be grazed during this period. Similarly, rotation pastures containing species like alfalfa, bromegrass, and Ladino clover should not be pastured during this month because pasturing during September increases winterkilling. In many cases, however, opening all the gates to all the forage fields—both old and new—results in considerable pasturage without injury to any because of light grazing.

Again, we can look to Sudan grass for supplementary pasture—expensive pasture on a cow-day

basis but most valuable since it furnishes pasture during the critical period of September 1st to October 15th. Properly-managed reed canary grass pasture provides abundant pasturage during this period to strengthen further the weak link in the pasture system.

Hay fields or pastures which are to be plowed may well be pastured in September. This would include alfalfa-brome and June clover-timothy mixtures. One of the advantages of using shorter crop rotations is that legume-grass sods are plowed every 2–4 years which should give nearly every farmer opportunity to have at least one field each year that is being plowed up.

Forage crops used for pasturage differ from other commonly grown feed crops in that forage crops may be harvested throughout the entire summer. Unfortunately, many forages drop in tastiness and feeding value as they approach maturity. In early May and June, pastures usually produce more than is necessary for the amount of livestock being carried on the farm. The ungrazed forage continues to grow and is eaten during late July and August only because nothing else is available.

Farmers who have permanent Junegrass pastures will find that the low yields and poor quality of Junegrass makes it of little use as a hay or pasture crop. With rotation pastures, however, the surplus growth of superior species like alfalfa, Ladino clover and bromegrass can be harvested in early summer during the period of peak growth and used for hay or silage feeding later. This growth can always be used to supplement pastures during the latter part of a droughty summer.

What can be done on your farm for better pastures in the future?

You can plan to include, alfalfa-brome mixture (add some Ladino to the mixture on moist land) in your seedings this spring for 1951 pasture.

You can sow oats or Sudan grass for supplemental feeding this coming pasture season.

Use your present alfalfa-bromegrass pasture to best advantage by harvesting any excess growth in June for hay or silage. This can be fed later in the summer or used for winter feeding.

Make the best use of that June clover-timothy sod or by pasturing in August if extra pasture is needed.

Maybe that old unproductive Junegrass should be plowed this summer and seeded in August to a rotation pasture like alfalfa-bromegrass-Ladino clover. That 5-acre swampy muck which is now producing nothing useful could be seeded to reed canary grass this coming August to provide continuous pasturage in 1952.

Pastures are the cheapest feed a farmer can grow on his farm for any kind of livestock. Let's plan them now for better pastures.

Loose Housing for Dairy Cattle

Condensed from Holstein-Friesian World

Professor Stanley A. Witzel
Agricultural Engineering Department, University of Wisconsin

About ten years ago our Dairy Herd Improvement Association work was progressing nicely, being well established again after the depression of the early 30's. We were locating our best cows and those not so good in our herds, under test. The proven sire program was well established and artificial insemination was being readily accepted. There remained one perplexing problem for the dairy husbandman and that was the relatively short life span of the average milking cow. This was estimated to be a little less than 3 lactation periods for the cows of the State of Wisconsin. Here was the weak link in our dairy herd breeding program. Cow families simply cannot be built on an average of 1½ heifer calves per cow. The question was—"How could the productive life of those good brood cows with the best production records be lengthened so large cow families could be built during their lifetime"?

Economics also entered into our considerations. It takes about two lactation periods to pay for growing out a heifer. She will most likely reach her peak of production sometime between her fifth and eighth year. The average cow was only starting to get into her profit-making period and her period of very best production by the time she was disposed of. That was a loss or a sure way to avoid making a profit!

Observation seemed to indicate that the high producing cow,—the cow with a large, extended udder for a period of several months was the most likely to injure herself and was often the first to go, whereas, she was just the one that should have stayed a good number of years. It seemed that something should be done to try to improve the situation and it seemed that dairy cattle housing might stand some investigation.

To carry out suitable research on dairy cattle housing, the University of Wisconsin entered into

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a cooperative Dairy Barn Research Project with the Carnegie-Illinois Steel Corporation. The objective of this project was to improve dairy cattle housing and the yardsticks for measuring the effectiveness of this housing were to be:

1. comfort, health and length of animal life
2. quality and quantity of milk produced
3. building and equipment costs per unit of product
4. labor requirements
5. efficiency in the use of feed and bedding
6. flexibility of structures to accommodate fluctuating herd size
7. temperature, humidity and condensation conditions
8. means of improving performance and dairy structure costs
9. application and serviceability of steel to dairy structures

Perhaps the most important step in setting up the Dairy Barn Research Project was the joint sponsorship by the Dairy Husbandry Department and the Agricultural Engineering Department.

The industrial fellowship supplied buildings and the funds for a full time research worker. The University supplied the site, feed, labor, a high producing herd and supervision. In return, our institution received the milk and any herd increases. For the industrial cooperating agency, we were able to develop a new system of site welded construction for farm buildings. The project afforded ample opportunity for us to study the performance of steel products under service in dairy cattle housing structures. The findings of the project are published and are available to anyone wishing to use them.

The project as we finally set it up was to house a control herd of 17 cows in a conventional stanchion barn built as well as we knew how to build it. Wide stalls, 4′ 10″ wide with 4 inch curbs were to protect cows from injury by being stepped on by cows in adjoining stalls. Columns, often credited for being responsible for causing udder injuries, were eliminated by using a steel trussed roof. High back mangers were to avoid injuries from slipping while reaching for feed pushed out of the manger. Thorough ventilation, insulation, good lighting and a maximum of fire safety were planned.

The test herd in the cold, open loose housing system had what we considered to be adequate space for eating and resting. Pens were provided in each barn for the calves in each herd. Feed was to come from a common source, be weighed and fed as nearly equal as possible for each herd. Likewise bedding records were kept for each herd. Cow and calf weights were taken each two weeks. Milk was weighed each milking and composite samples

taken over each milking period for butterfat test. The herd was also on official test. Milk quality records were maintained. Temperature and humidity records were secured through self-recording instruments in each barn and out of doors.

The test period was set up to run for 6 months each year, starting about October 15th. At the beginning of each test period the herd is divided into groups as evenly as possible and a drawing decides which group goes to each barn.

Some adjustments were necessary to make the loose housing system work properly. In fact, it took about three years to get everything working to our satisfaction. Here are some pointers from which any beginner can learn a lot so he doesn't repeat the mistakes we made.

1. The cows were dirty and difficult to clean for milking. The bacterial counts often ran high. The feeding area seemed to be a mess all the time and punched up so badly we bedded twice a day. Still the cows would lay down in this trampled area and get dirty. They did not seem to make any effort to pick a clean place to lay down. Finally we cleaned this feeding area, paved it and cleaned it daily. The cows still pulled hay out of their mangers and would lay on this. Finally we rebuilt the mangers, making them 22 inches deep. Wasted hay was thus controlled.

We tried cleaning out the bedded area in the winter. While cleaning, we noticed the cows all lying on the area to be cleaned. We were asking the cows what they preferred and they were telling us they preferred the deep bedding. We got the thermometer and found the temperature of the manure pack to be between 80 and 100 degrees. Little wonder the cows preferred this warm, soft bed in a barn only 8 to 12 degrees warmer than outside temperature. This loose housing system calls for a deep manure pack that is undisturbed throughout the winter and early spring months. Higher concrete walls were built for a 36 inch manure pack. Here, at last, was an answer to the preservation of manure for application to the field at the proper time of the year with the least possible loss of fertilizer value!

When it can be plowed under as hauled, as much as $3.00 worth of available nitrogen can be saved for each ton of this well-preserved manure to be hauled. Loaded with a tractor mounted loader, it took 2 man-hours to load, haul and spread the manure produced by one cow for the season.

At first, our bedding requirements were high—from 2 to 2½ times that required for the stanchion barn. The paving of the

feeding area and the setting up of a sort of bedroom for the cows where they could go to lie down, but out of all traffic lanes, worked out better than we expected. Bedding requirements dropped to about twelve pounds per cow per day as compared to eight pounds per cow per day for the stanchion barn. This was 1½ times more and even this can be reduced through good bedding management.

In order to try out the idea of an insulated, warm, loose housing system with the cows shut in, except for an hour of exercise outside, the same as the stanchion barn herd, we added a third unit to our housing system and a third herd of 17 cows. Two years of operation proved to us that the system was not nearly as successful as a cold, open barn so we opened it up, lowered the temperature and let the cows go outside as they pleased. The barn has been much more successful since being opened up and cooled off. The air is fresh, bedding requirements are less and the herd is performing better.

The following is a summary of our past four years of operating the cold, un-insulated, loose housing barn as compared to the control unit which is the conventional stanchion barn.

METHODS AND RESULTS

1. and 2. *Temperature* and *humidity* records are maintained throughout the entire test periods with recording hygrothermographs. Instruments are located in each barn and out of doors.

3. The *manure pack temperatures* are taken periodically. Thermometers are used for taking these readings at stations established in the manure pack area.

4. *Stall barn floor temperatures* have been obtained periodically. Thermocouples were laid in one and two individual stalls, and readings taken with a potentiometer.

5. *Labor comparisons* are made each year. Time studies are taken with one observer for each worker. Operations are timed to at least the nearest five seconds. These studies include at least five complete days each year. Some observations are made on random days, while others are for a period of several consecutive days.

6. *Feed Consumed.* All the feed consumed in each barn is weighed and comes from a common supply. Silage and hay are weighed in bulk for each barn before they are fed. Grain is weighed out individually for each cow, and the total grain fed each barn is weighed. All feed figures are computed on the basis of total digestible nutrients (T.D.N.) consumed.

7. *Bedding* is weighed out the same as feed. Each barn is bedded down once a day. For the past three years bedding requirements

have been considerably lower in C barn than previously reported. During this period it has not exceeded 150% of the amount used in A barn. The A barn average for the last three years was 7.89 lbs. per cow per day (100.0%). C barn averaged 11.49 lbs. per cow day (145.61%).

8. *Milk production.* Each individual cow's milk is weighed every milking. A sample from each milking is placed in a composite sample. These composites are tested for butterfat content once each week, and form the basis for the production records shown. All milk production is computed on a 4% fat corrected milk (4% F.C.M.) basis. The feed cost figures in 8-d are not actual but comparative figures.

9. *Bacterial* counts and sediment tests are taken periodically.

10. *Cow weights.* Cows are weighed in for 3 consecutive days at the start and completion of the test period. During the test period, cows are weighed every two weeks.

11. *Calves.* Three or four heifer calves, 4 months of age or less, are allotted equally to each barn at the start of the test period. During the test period all bull calves are removed after three days. All heifers born are retained in the barn they were born in for the remainder of the test period. Calves are weighed in the same manner as the cows. Feed and bedding are handled the same as for the cow. 11A shows A barn calves gaining considerably more than C barn calves. This may be accounted for by the fact that less heifers were born in A barn, and the average age of the calves was greater. Since C barn calves average age was less, a greater per cent of their ration consisted of milk, possibly accounting for the better gains per pound T.D.N. consumed in C barn (11B).

12. *Herd health* records are maintained throughout each test period. Veterinary reports and records obtained by the herdsman and project personnel form the basis for the herd health record. Obviously, not all of the items listed can be attributed to the barn in which the cows were housed.

Dairymen in many states, from Massachusetts to Utah and from Wisconsin to Mississippi, not to mention those from nearly every foreign country in the world have been following the work at the Wisconsin Station. Some 7000 people have visited the project each year. Many have pioneered with us and have reported back their experiences. The encouraging part of it all is that success has come to those dairymen who had a full appreciation of the fine points of dairying. Their reports are all alike. At last, we have mastitis under control, we are growing replacements much faster than we are losing cows. Often

there has been no mastitis, or only a few cases of flaky milk, responding to treatment after chronic offenders have been sold. Sometimes there has been no loss of cows for the past season.

Reports of failures or problem layouts almost invariably go back to three of four causes. These include the absentee landowner who wanted a low-cost housing system but who failed to consider the need for selling the idea to his tenant, first. The second cause for trouble has been in cases where the cows have been fed on the bedded area, held on the bedded area before milking and routed across the bedded area from feeding to exercise in the lot. Some owners have made the same mistake we made in thinking that a warm, insulated barn might be better.

The planning of a loose housing system usually fits in well as a remodelling project in the efficient use of all existing buildings. For a new layout one can have the permanent, more expensive concrete foundation and frame of wood or steel. On the other hand, he may choose the creosoted pole type of shed which is economical to build, often reducing the housing cost for the dairy cow 50% or more.

The simple rules for planning a loose housing system include the following four steps.

1. *Bedded area* of 60 square feet per cow plus necessary pen space for calves, young stock and hospital needs and plus the space either at floor level or in a loft above for adequate bedding storage. This area should be graded up above outside ground level but a dirt floor is adequate.

2. *Feeding area* at least for hay under roof. This paved feeding area with a south or east side opening out onto a wind protected paved lot is most convenient. Hay should be stored above or along side the manger. Where hay and silage are fed at the same manger, allow 27 to 30 inches of feed manger per cow. To save time, silage is often fed out of doors so hay and silage may be fed at the same time and once a day only. In such an arrangement from 1½ to 2 feet of manger per cow is adequate.

The paved feeding area may also be used as a holding area for the cows waiting to be milked. It should be cleaned daily or as required.

3. *The poved barn lot* providing about 100 square feet of concrete per cow, plus a sodded pasture available in winter and when the ground is firm and dry for the cows to get off the concrete and on warm fall and spring nights for them to rest out in the open is a "must." Good drainage and good wind protection are essential while good board or plank fencing is the safest for the cows.

The barn yard should be cleaned as required.

4. The last, but most important step is the *farm milking plant* which includes the milking stalls and milk house. It is essential that this building be built to meet all sanitary requirements, the same as it is necessary to operate the rest of the loose housing system so the cows are kept clean.

For a low cost development, from 4 to 10 stanchion stalls with a feed manger 18 inches above the floor may be used. Eventually, every dairyman will want to elevate his cows so they stand 30 inches above the floor on which he stands for milking. This eliminates stooping and it makes good milking easier because all work is done at a level where the udder can be seen.

The cows may be fed concentrates in the milking parlor, but deep, enclosed feed boxes are needed to prevent waste of feed on the floor. One can figure about 8 cows per hour per elevated stall and still provide time for the cows to eat their rations.

To study various milking parlor arrangements your State Agricultural Research Station has been cooperating with the other stations in the Midwest by making available to our project, regional funds from the Agricultural Research and Marketing Act funds. Here we have tried out four types of parlors with elevated stalls. They are all good. Some a little better than others. We hope to have a report out soon. The 4 parlor arrangements studied include the two, three and four stall tandem type parlor, the three and four stall "U" type parlor, the two and four stall Montana type parlor and the two and four stall chute type parlor.

	A BARN			C BARN		
	No. Cows Affected	Prod. Lag*	Serious **	No. Cows Affected	Prod. Lag*	Serious **
A. Stiffness and lameness	18	8	2	0	0	0
B. Injured knees and hocks	8	3	2	0	0	0
C. Abscessed hocks—operated	3	2	2	0	0	0
D. Stepped on teats	11	4	6	0	0	0
E. Foot Rot	8	3	0	3	0	0
F. Cow pox	3	0	0	3	0	0
G. Acetonemia	4	3	1	3	0	0
H. Metritis	1	0	0	0	0	0
I. Flaky milk—not chronic	9	3	0	10	0	0
J. Flaky milk—chronic	8	3	3	7	1	0
K. Mastitis—sub-acute	1	1	0	4	4	0
L. Mastitis—acute	7	7	6	1	0	0
M. Reproductive disorders	3	1	2	1	1	0
N. Off feed	6	5	0	4	2	1
O. Milk Fever	1	1	0	0	0	0
P. Other injury	0	0	0	2	0	0

* Production lag means a noticeable drop in production for a short period of time.
** Injuries were considered serious when they had a lasting effect on the animal.

	Outside	"A" Barn	"C" Barn
1. Temperature (4) (a)	29.75° F	54.78° F	37.19° F
2. Humidity (4) (b)	72.46%	81.36%	78.19%
3. Manure pack temperature—ave. 3" from surface (4) (b)			84.90° F
4. Stall barn floor temperature—ave. (3) (b)		58.07° F	
5. Labor comparisons (4) (b)			
A. Actual summary of original time studies		100.0 %	82.75%
B. Actual time plus time for cleaning			
C. Barn loafing area, mechanically		100.0 %	84.65%
C. Actual time plus time for cleaning			
C. Barn loafing area by hand		100.0 %	93.00%
6. Feed consumed (Cow day basis) (4) (A)			
A. Silage		100.0 %	100.26%
B. Hay		100.0 %	103.76%
C. Concentrates		100.0 %	100.0 %
D. Total T.D.N.		100.0 %	102.42%
7. Bedding (Cow day basis) (4) (A)			
Pounds per cow day		7.68	12.39
Percentage comparison		100.0 %	161.33%
8. Milk Production (4% F.C.M. Basis) (4) (A)			
A. On a total cow day basis		100.0 %	104.55%
Actual pounds		29.48	30.82
B. On a milking cow day basis		100.0 %	102.79%
Actual pounds		35.10	36.08
C. Lbs. T.D.N. consumed per lb. F.C.M. (4%) produced		100.0 %	97.98%
D. Cost per lb. 4% F.C.M. produced .. Concentrates @ $60.00, Hay @ $20.00, Silage—⅓ hay cost		100.0 %	97.44%
9. Bacterial Counts (a)			
A. Arithmetic average—counts taken at plant on pooled, raw milk (4) ..		4,340	7,136
B. Arithmetic average—counts taken at plant on pasteurized samples of pooled milk—check for thermoduric bacteria (3)		122	101
C. Average sediment tests—based on Sediment Standards of Wis. Dept. of Agr. on a 1, 2, 3, 4, basis, 1 being cleanest (3)		1.80	1.77
10. Cow weights—ave. lbs. gain per cow per test period (4) (b)		13	49
11. Calves (a)			
A. Gain per calf per day (4)		100.00%	88.32%
B. Lbs. T.D.N. consumed per lb. gain (4)		100.00%	85.37%
C. Lbs. Bedding/calf day (3)		100.00%	71.36%
12. Herd Health (total cases) (3)			

(3) Comparable records covering 3 years (1946–49)
(4) Comparable records covering 4 years (1945–49)
(a) Figures shown are averages of totals for all test periods involved.
(b) Figures shown are averages of the yearly averages.

Improve Poultry Manure for Fertilizer

Condensed from Eastern States Cooperator

Rodger Smith

EVERY ton of poultry litter and droppings, as they are commonly handled, contains about 50 pounds of nitrogen, 45 pounds of phosphoric acid, 25 pounds of potash and considerable organic material at the time it is removed from the poultry house. In addition there are small amounts of secondary and minor elements such as calcium, magnesium, and boron. Each ton contains approximately the same amount of nitrogen and phosphorus and about half as much potash as in 500 pounds of 10–10–10 fertilizer. As fertilizer, this manure represents a sizable dividend on the investment in feed and litter. This source of fertility can be put to better use and can be made even more productive with the aid of new information.

Originally poultry manure contains about 75 per cent moisture. It analyzes about 30 pounds nitrogen, 20 pounds phosphoric acid and 10 pounds potash per ton. The extensive sampling and analysis work done for this project confirm these figures. It was observed, too, that there is usually a large and fairly rapid loss of nitrogen. For instance, dropping board manure (containing no preservatives) accumulated for 15 weeks from nine farms and then analyzed showed a 43 per cent reduction in nitrogen, whereas the phosphorus increased 11 per cent and potash increased 36 per cent.

Why these drastic changes within a few weeks? Poultry manure as voided contains about 60 per cent of its nitrogen as uric acid, 30 per cent as more stable organic forms, and less than 10 per cent as ammonia nitrogen. The uric acid nitrogen changes rather rapidly to an ammonium compound from which the ammonia can escape into the atmosphere, particularly during warm weather. Analyses of under-roost manure made one month after voiding showed more than one-third of the nitrogen in the ammonia form. The phosphorus and potash and other elements are more concentrated after storage because of loss of moisture and decomposition of some organic material.

Feed used has more effect on the content of manure than does the breed of poultry. Nitrogen content of the manure increases

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with an increase in protein content of the feed.

Content of the floor manure varies somewhat with the litter used because of its own analysis and also because the drier the litter, the less the loss of nitrogen. Peat materials contain a substantial amount of nitrogen, grain straw somewhat less, and wood sawdust or shavings contain the least nitrogen of common litter materials. Grain straw also contains at least one per cent potash. A comparison of four litters used for six months indicated that a mixture of rye straw and wood shavings is very effective in keeping the moisture down and preserving nitrogen. The moisture content was 16 per cent whereas the other litters—a mixture of oat and rye straw, rye straw alone and sugar cane litter had 25 to 28 per cent water at time of analysis and preserved somewhat less nitrogen. Peat is recognized for its value as a litter; it is also an effective nitrogen conserver. Trials made at Connecticut indicate that sugar cane litter preserved about as much nitrogen as does the use of 200 pounds of 20 per cent superphosphate mixed with a ton of manure.

Uncertainty as to the analysis of the manure when applied to the soil has made it difficult for agronomists to make recommendations for its use. This project accumulated a substantial amount of information on content of manure handled in many different ways. With the rather general practice of storing dropping pit manure for considerable time and using a built-up litter, the resulting product is found to be fairly uniform. If we think of a ton of mixed poultry manure containing the amount of nitrogen and phosphorus in 500 pounds of 10–10–10 and half that amount of potash, we will be fairly accurate. With the use of preservatives, the nitrogen content will be somewhat higher. If the preservative used is superphosphate, the phosphorus content of the manure, of course, will be higher.

When manure is stored out-of-doors after being removed from the houses, losses will occur as a result of rain water leaching through it. Heating of manure piles encourages escape of ammonia nitrogen and decomposition of the organic matter.

Production of manure was found to average just over seven tons per 100 hens a year. Rhode Island Reds were slightly the heaviest producers with Barred Plymouth Rocks next and then New Hampshires and White Leghorns. From carefully kept records of both feed consumption and manure production, it was determined that one and eight tenths pounds of manure (75 per cent moisture) is produced for each pound of grain fed. This ratio en-

ables an easy estimate of manure production. One-third of the manure is deposited on the dropping boards and two-thirds in the litter. The weight of manure hauled from the houses, however, is lowered by a reduction of moisture and by decomposition and is increased by the amount of litter added.

Recognizing that poultry manure does lose a considerable amount of nitrogen as a result of handling, both in the poultry house and in the field, what is there that can be done to conserve more of this element?

Superphosphate and hydrated lime have been the most recommended preservatives. These materials have been demonstrated to be the most effective of a wide variety of materials and can be used safely. In the trials made with these preservatives added to fresh manure under poultry house conditions or as spread in the field, 20 per cent superphosphate at 300–400 pounds per ton of manure topped the list. In all tests, 46 per cent triple superphosphate was less effective in preserving nitrogen. It should be mentioned now that the application of superphosphate in combination with manure has extended the time during which the phosphorus remained in a so-called available form.

Hydrated lime at 200 pounds per ton was the next best preservative, with small amounts of lime being less effective or even detrimental. The reason for small applications (50–100 pounds per ton of manure) not preserving nitrogen is that lime when applied liberates some nitrogen which is already present as ammonium carbonate without being adequate to make the manure sufficiently alkaline to retain the remaining nitrogen in a more stable form. Repeated applications of hydrated lime mixed with the litter are necessary for it to be effective. The lime is generally regarded as useful in keeping the litter in condition and aiding with damp litter problems.

Other materials experimented with at Connecticut were borax, muriate of potash, common salt, sulfate of potash and gypsum. Borax is quite effective but at rates which might lead to boron toxicity to crops at the rates the manure might be applied. A combination of 80 pounds of 20 per cent superphosphate and 50 pounds of muriate of potash added to each ton of manure with the idea of making a 1–1–1 ratio fertilizer was unsatisfactory as a preservative. Each of the materials tried has some chemical reason for possibly being effective. Lime makes the manure alkaline, thereby affecting certain microorganisms, borax and salts of strong acids have a disinfecting and chemical action and other

materials such as superphosphate combine chemically with ammonia.

Hauling manure directly to the field where it is spread has long been recognized as a nitrogen conserving practice. If it is being applied on cultivated land, harrowing in or plowing under the manure will stop further volatilization of nitrogen to the atmosphere. Air moving over manure spread in the field causes substantial nitrogen losses. Freezing of spread manure also encourages the escape of ammonia nitrogen. Using preservatives in the poultry house and getting the manure incorporated with the soil will make maximum use of the plant food it contains.

As a result of extensive work done on analysis and preservation of manure, the following suggestions are made with the purpose of improving laying house conditions and conserving more of the fertilizer nutrients in the manure.

1. Maintain four or more inches of dry litter.

2. Add hydrated lime to the litter, especially around fountains, to improve its condition and to preserve nitrogen. Where used make liberal and repeated applications of 25 to 30 pounds hydrated lime *weekly* for each 100 hens. Stirring litter after application mixes the lime with the litter and also aerates it, thereby tending to dry the litter.

3. For each 100 hens, spread two pounds of 20 per cent superphosphate *each day* on the dropping boards or pits. Daily use of the superphosphate enables the prompt contact between preservative and manure, demonstrated to be important.

4. For lower rates of manuring many crops, add 50 pounds of muriate of potash to each ton of manure as it is hauled to the field, recognizing that the potash level in poultry manure is lower than is the nitrogen and phosphorus.

5. Spread the manure after removing from the houses.

It is obvious that adding materials to poultry manure for any purpose other than to improve poultry house conditions is good business only if the manure is to be used for crop production. Manure that is to be discarded or is available far in excess of the needs of the crop acreage which it will fertilize, hardly justifies the use of nitrogen preservatives.

Less Danger for Your Livestock

Condensed from Kansas Farmer

E. E. Leasure, Dean
School of Veterinary Medicine, Kansas State College

THE present position of respect and esteem held for the veterinary profession by livestock and poultry people, and the public in general is no accident. The veterinary profession has earned and gained this recognition because of its continuous and steady growth, development and ability to cope with problems and conditions as they arise.

Veterinary medicine as a science is relatively a young profession, and particularly so in Kansas, but as an art it is ancient. Since the earliest association of man with domesticated animals, doctoring such animals for diseases and ailments in general has been practiced. Thus, man, for his own benefit, assumed responsibility for the care and welfare of his animals. Ancient governments, as indicated by their early writings, made administrative provision in their laws for the doctors of animals.

As the importance of animal industry grew, greater demands were placed upon veterinary medicine for knowledge in control and eradication of animal diseases. Man early discovered both animals and man were susceptible to some common diseases. This knowledge contributed greatly to the growth and development of the profession by spurring its quest for information thru research.

The first school established for formal instruction in veterinary medicine was founded in Lyons, France, in 1761. In the United States the first attempt to form a school of veterinary medicine was made in Philadelphia in 1850. That attempt failed. The first school to be organized with success was the New York College of Veterinary Surgeons, organized in New York in 1857. From this period on many schools of veterinary medicine, both state- and privately-operated, were established. Some were quite successful and others met with failure and disappeared.

By 1925 only 10 schools of veterinary medicine remained and these were all state or partly state-operated. During this developmental period curriculums were expanded to include 4 years of professional study. By 1935, most

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schools had expanded their curriculums to 5 years, and by 1949 all schools had expanded to 6 years of study, including 2 years of pre-veterinary medicine and 4 years of professional study. Since World War II, 6 new state schools of veterinary medicine have been organized.

At Kansas State College courses in veterinary medicine were taught in a rather informal way in the School of Agriculture as early as 1884. Later a Department of Veterinary Medicine was organized and the first degree—Doctor of Veterinary Medicine—was conferred upon the class of 1907. The present School of Veterinary Medicine was set up as a separate unit of the college in 1919.

Just before the turn of the century many perplexing animal diseases were being investigated by the best research workers of the period. Texas fever of cattle was being eradicated; glanders, anthrax, blackleg, tuberculosis, rabies, hog cholera and many other diseases were high on the priority list of investigation.

Since the turn of the century tick or Texas fever has been eradicated. Glanders has not appeared in Kansas for many years. Tuberculosis of cattle, because of an eradication program, has been reduced to less than one half of one per cent infection in every state of the union. Several outbreaks of foot-and-mouth disease of cattle in this country were completely eradicated by rigid quarantine and slaughter methods.

Early in the century the Kansas station sent out hundreds of thousands of experimental doses of blackleg vaccine. This early research with blackleg led to a vaccine that is almost perfect when used to control this disease, and now cattle owners need no longer fear the once great losses from blackleg.

Kansas, as well as many other states, pioneered in early development of anti-hog cholera serum and virus. Now for many years hog cholera has been successfully controlled when susceptible pigs were properly immunized. In addition, this half-century has seen development of additional vaccines for prevention of hog cholera that hold much promise in displacing anti-serum and virus immunization.

Because of refinement of breeds, concentration of livestock, movement of livestock and poultry, importation of livestock and poultry, and a decrease of nutrients and inorganic elements in feeds as a result of farm practices, many new and old diseases have made their appearance and are of considerable economic importance as well as of great concern from a public health standpoint.

A few of these diseases are as follows: Anaplasmosis of cattle; brucellosis of cattle, swine and

goats; equine encephalomyelitis; erysipelas of swine; Rickettsia diseases; psittacosis; Newcastle disease of poultry; pullorum disease of poultry; blackhead in turkeys; various and sundry nutritional deficiencies in animals and poultry; infectious gastroenteritis in pigs; milk fever of cattle; acetonemia of cattle; infectious necrotic enteritis in pigs and many others. Of these, many are of public health significance because they are transmissible to man. A classical example being brucellosis which causes brucellosis or undulant fever of man.

During the latter part of this half-century great progress has been made in understanding the cause and nature of specific diseases together with prevention, treatment and prophylactic immunization.

Less than 30 years ago almost all animals affected with Prussic acid poisoning—from eating second-growth sorgos—would die; now these can be successfully treated and almost 100 per cent will return to normal.

New discoveries made in treating milk fever of cattle have resulted in miraculous cures. However the job is not done until proper methods of prevention are found.

Surely one needs to reflect but a moment upon the progress of this half-century to unfold a miraculous picture of development in the field of veterinary medicine. This should include a survey of the information at hand of animal diseases caused by viruses, bacterial organisms, protozoa, parasites, endocrine imbalances, vitamin and general nutritional deficiencies. Methods of control, prevention and treatment of these diseases have contributed greatly to the advancement of our knowledge of medicine, including preparation of biologics, pharmaceuticals, drugs and chemicals, endocrines, vitamins and antibiotics.

In summarizing activities of progress made during this last half-century the veterinary profession can point with pride to its contributions to (1) our national economy, (2) human health, and (3) science in general.

What is a Farm Worth?

Condensed from Missouri Ruralist

Cordell Tindall

In these days of 100-bushel corn yields, large yields of rich legumes, fancy prices for feeder calves and a generally prosperous farm economy, it would be easy to go on a land-buying binge. For a sobering dash of cold water, just talk to a land appraiser—such as appraisers for the Federal Land Bank, or for some of the large insurance companies that make farm loans.

Today these appraisers might appear as thick-hided pessimists, but they can't forget the dry and low times of the early thirties. They look at graphs of rising and falling land prices of the past, and are sure they will rise and fall again. And as these appraisers explain the cold facts you have the disconcerting feeling that they are right.

What is a farm worth? That's a big question at any time. Is there any formula by which you can scientifically calculate the earning power of a farm?

To answer these questions the Division of Agricultural Education of the State Department of Education in Missouri held 2 land appraisal schools this fall. Attending were Vocational Agriculture instructors of the area, instructors of veterans' classes, and other interested persons. One school was held at Kirksville, the other at Tipton. Operation of both schools was similar.

First, all "students" visited an actual farm and toured fields and farmstead with Federal Land Bank appraisers. Everyone was asked to make an estimate of the "normal" value of the farm, and also the current market value.

In the afternoon, Agricultural Extension Service specialists in farm management and soils told how the farm visited could be improved using modern practices. Then, Land Bank appraisers showed the step-by-step method of arriving at the normal value of the farm.

Accompanying talks by the "experts" was a lively discussion. Chief issue raised was whether lending agencies should include as part of the loan, money for building soil fertility of the farm. Potential productivity of the farm, by use of better farm management and commercial fertilizers, was a point that brought on interesting debate.

This matter of normal value of

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land is the crux of the whole land appraisal problem. As Ralph E. Nowlan, chief appraiser of the St. Louis Federal Land Bank said, there's a difference in what a man is willing to pay for a farm and what he is justified in paying. Real value of a farm depends on the potential income from the farm, its location, the hazards for successful farming found there (such as floods, erosion, coal stripping), general desirability and its salability.

For a practical approach to figuring value of a farm we would like to quote from a land appraisal manual prepared by the Prudential Insurance Company of America.

"In appraisal of a farm, the problem is to determine what the farm will produce in dollars over a long period of time when operated by a good or average operator."

Emphasis on the average operation of a farm was stressed by Land Bank appraisers, too. Outstanding farm managers may win Balanced Farming Contest awards, but they get scant attention from practical-minded land appraisers. Farms change hands with long-term loans so the Land Bank figures average operation of the farm thru the years.

How do we go about putting value on a farm? First of all, soil is perhaps the most important factor. Soil determines productiveness of the farm, unless we merely use the land for a base of operations such as with a poultry farm.

Most of us know the fundamentals of judging soil. By observation we can determine its color, depth, and usually its texture. With a soil auger, or even a spade, we can gauge the depth of the layer of topsoil on the ridges, on the slopes and in the bottoms. We can see whether there is a hardpan under the topsoil. Final test of a soil is in a soil-testing laboratory. Here we can find how much plant food remains in the soil. We can find accurately what is needed in the way of lime, phosphate and other fertilizers. The state's system of soil-testing labs should be used more by prospective land buyers.

Dr. E. R. Graham, of the University of Missouri Soils Department, pointed out at Tipton that another factor to consider in judging soils is the water-holding capacity. If you can get water into the soil ordinary land will go from 6 to 8 weeks without rain without severe damage to growing crops.

Arnold Klemme, extension specialist, suggested that you can tell a lot about soil by looking at the vegetation that is growing on it. Lespedeza, for example, will grow on land low in phosphate because the crop has the ability to use "harder-to-get" phosphate in the soil.

And, as Mr. Klemme pointed

out, today we know more about increasing productiveness of soil with commercial fertilizers. Perhaps this makes the original soil less important. However, we must remember that soil building costs money, a complete treatment of mineral fertilizers may require from $15 to $40 an acre.

Land Bank appraisers are not as optimistic about building land with fertilizers as Mr. Klemme—as might be expected. They don't lend money on good intentions; fertility of the land has not been increased until the fertilizer actually has been applied, they point out.

The Land Bank also places much emphasis on general customs of farming in a community. If it is the general custom in the community to use heavy applications of fertilizer, they would be more likely to take this into consideration.

They take much the same outlook on such soil-conservation practices as terracing. As yet, no extra value is given to a terraced field or farm. If it is the general custom to terrace in the community, then more weight is placed on the fact that a farm is terraced.

Naturally, there's more to a farm than the soil. The next most important factor is buildings. Appraisers cast a critical eye at the farmstead with a view to its practical use. Some buildings they consider a liability. Too many buildings may be as bad as too few. A huge, obsolete house has little value.

In making the appraisal, potential value of each field on the farm is calculated, using "normal" yields and "normal" prices for crops. This gives value of the land.

Then value of each building is calculated, also with some consideration of "normal" values.

But final appraised value of the farm may not be value of land plus value of buildings. The total figure is a balance of the value of the land with the value of the buildings.

There are also many other interesting factors to consider in placing a value on a farm. The location of a farm is highly important. Distance from nearest highway is important. Conveniences of modern farm living are worth money, such as REA, mail, telephone service, milk routes and good roads.

Water supply on the farm is a factor, both for domestic use and for livestock. Real estate agents are quick to point to springs that never run dry.

And here's something else you may not have considered: The community in which the farm is located is judged. As a general practice land appraisers class communities in 3 groups—A, B and C. Top A rating is given only to areas of good, fertile farms in

thriving communities. B communities still are good farming areas. C rating is for average farms in average communities.

What makes a good community? Good land, of course. Churches, schools and business centers are considered. Appraisers look at the entire community. They look at the people.

All of these factors were considered by appraisers Marvin Klein, of Sedalia, and L. H. Dysart, Columbia. The 119-acre farm examined by the group was appraised at a normal value of $3,020.

The farm examined had been chosen because of its history. The Federal Land Bank had lent money on it several times, and today the farm is clear for the first time since 1904.

Keep in mind that the farm was appraised for a little more than $3,000, normal value. In 1904, this farm was bought for $3,800. A $2,000 loan was made and in 1907 this was increased to $3,000. Top sale price came during the first World War when the farm sold for $10,500. After some involved financial transactions, it was foreclosed by the Land Bank for $5,000 in 1933. In 1934, the farm sold for $4,000 with a $1,000 down deposit. In 1941 it sold for $5,000. In 1948, this farm was bought for $7,000 and the present owner paid for it in 1950—with income not made entirely on the farm.

Present market price is put at $8,000.

The "amateur" appraisers put all kinds of prices on the farm, indicating there are wide differences of opinion as to the value of a farm. Whether methods used by land bank appraisers, and other land appraisers, have kept up with modern trends remains to be seen. Certainly, these methods are safe and conservative.

Land is selling at a fairly brisk pace in Missouri now. There is particularly good demand for cheaper farms. Many out-of-state buyers who have sold high-priced land in the Corn Belt are buying Missouri farms that sound unbelievably cheap to them.

The land-appraisal school sponsored by the Division of Agricultural Education certainly was enjoyed by those attending. Many pertinent questions were raised. Should a farmer buy more land or add fertility to what he already owns? What effect does a livestock program have on the value of a farm? These and many other questions are vital in placing a final value on a farm.

Wider Use of Weed Killers

Condensed from The Farmer

EXPERIENCES of 167 weed control specialists of 13 states and three provinces of Canada, recounted at the seventh annual North Central Weed Control Conference held recently in Milwaukee, Wis., point the way to widening the use of 2,4-D, and making greater use of some of 2,4-D's later born cousins, 2,4,5-T, TCA and others.

Some of these specialists who represent state and provincial experiment stations, the United States Department of Agriculture and manufacturers and distributors of weed control materials, reported the successful use of chemicals against some of the grass weeds, among them pigeon grass, as well as the broad leaved weeds.

Also reported was success with 2,4-D in the control of both grass and broad leaved weeds when applied on corn five to seven days after planting, and shortly before the corn plants emerge. Also among the scores of reports were several on the successful use of 2,4-D against Canada thistle, leafy spurge, and some others of the tough, hard-to-kill perennial weeds.

So that all who are interested in weed control may have sound information based on the many carefully conducted experiments in the North Central area, a committee representing the research workers each year at these conferences draws up a list of recommendations for the use of weed control chemicals.

On the subject of pre-emergence spraying of corn, the recommendation committee reported: "Pre-emergence treatments with 2,4-D will control annual grasses and some tolerant broad leaved weeds such as purslane, which are not controlled well by post-emergence sprays. On loam soils and those of finer texture pre-emergence use of 2,4-D is satisfatcory if applied 5 to 7 days after planting at rates of one to two pounds per acre . . ." On sandy soils there was some experience with damage to germinating corn resulting from rain leaching the 2,4-D down to the plants which had not yet emerged so in the statement is this sentence "Pre-emergence applications are not recommended on sandy soils."

Concerning the spraying of hard-to-kill perennials it was observed in the report that "best results are obtained by treating during the actively growing stage —generally near the bud stage.

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Two applications of 2,4-D each year over a period of two or more years is necessary to eradicate Canada thistle and perennial sow thistle. The first applications each year should be made at the bud stage, and the second in the early fall when the resprouting thistles are in the bud stage. One-half to two pounds per acre of 2,4-D acid equivalent should be applied, the lower rates being recommended where the weeds occur in growing crops."

Much the same recommendations apply to the use of 2,4-D against Leafy Spurge, Hoary Cress, and Russian Knapweed.

Applications of 2,4-D for control of creeping jennie or field bindweed are most effective in late fall or in the bud to bloom stages in the spring. "One-half to one pound of 2,4-D acid equivalent per acre is required to give practical control," the committee stated.

In connection with using the kinds of non-selective weed control materials that sterilize the soil, and therefore are certain death against the noxious, deep-rooted perennials, the committee stated: "These chemicals (Borascu and sodium chlorate) are especially valuable for obtaining quick eradication of small patches of weeds and weeds in uncultivated land where a period of sterility is not objectionable."

To control weeds in flax it is recommended that the spraying with 2,4-D be done as soon as there is enough emergence of susceptible weeds to make spraying practical. Use on flax heavily infested with pigeon grass of a combination of four ounces of 2,4-D and TCA at rates of five and 10 pounds per acre was reported by representatives of the F. H. Peavey Co. of Minneapolis. There was a 60% kill of the pigeon grass at the lower rate, and a kill up to 97% at the higher rate with no injury to the flax.

Recommendations for the use of 2,4-D in spring seeded small grain were the same as in previous years. The material should not be applied before the grain is four to six inches high and before the boot to dough stage of growth.

After much experimental work, the committee observed in connection with the spraying of small grain and flax seeded to Ladino, Alsike, Red clover or alfalfa that "the salts of 2,4-D at rates up and including one-fourth pound per acre," may be applied "without serious loss of stand." It was also stated, however, that sweet clover is so susceptible to 2,4-D that none should be used in fields where sweet clover is planted.

Although chemicals as a means of weed control may never completely solve the weed problem, certainly the new knowledge of

how to use them indicates that an investment in a sprayer for use on almost any Upper Midwest farm will pay big dividends.

The Beef Cow's Milk Equipment

Condensed from The Hereford Journal

Carl W. Gay
Worthington, Ohio

THE importance of the milk yield of a beef cow is a matter which merits broader consideration than it usually receives and concerning which there is much misunderstanding. It is casually concluded that the calf is all that matters and the more milk the calf gets the better. There is no better feed either for straight nourishment or for special fitting of the calf than his mother's milk and up to a certain point the more the better, but there is a limit because the calf is not the only consideration.

For the purpose of clarity and to avoid confused thinking it is important to qualify the cow in question as a strictly beef cow. As soon as hand milking is resorted to it becomes a dual-purpose proposition. If another calf is included in the cow's suckling responsibilities the strictly beef character of the enterprise is lost since twin or orphan calves are not regular items in the beef herd. If calves are compelled to poach on other cows to get the amount of milk they require because their mothers are poor milkers then the latter are not fulfilling their full obligation even as beef cows. Nurse cows are quite all right in the fitting of calves for show or sale but the cow that cannot do a good job of raising her own calf because of lack of milk is usually culled out of the herd unless she produces an exceptional calf.

In other words some beef cows give too much milk, some too little and the question is what amount is just enough. There are several factors operating. R. J. Kinzer disposed of the first one most effectively when he was called upon to defend the Hereford cow before a group of Ohio cattlemen he was addressing. One dairy-minded fellow in his audience charged that Hereford cows were poor milkers. "R. J." explained that by ordinary dairy standards this was true, and even compared in an average way with the cattle or other beef breeds Herefords did not excel. However, this was not a fault but a virtue covered

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by and resulting from the purposeful selection of their cattle by Hereford breeders.

Hereford cows are literally "home on the range" in greatest numbers. They so completely dominate beef production, purebred and commercial, in those areas of this country where most beef cattle are raised that adaptation to range production is one of the chief objectives of the breeder. Any cow giving more milk than her calf can take is a positive menace under range management and conditions and cannot be tolerated.

Therefore, what the calf can take very definitely fixes the upper limit of the amount of milk a beef cow should give. On the other hand, anything short of this amount would place the calf and the herd at a great disadvantage and it, too, should be selected against.

Udder development and the evidence of milking capacity are of great importance in evaluating the breeding cow even of strictly beef type. Lactation is a maternal function, an expression of femininity and is thereby correlated with reproduction. Peter Ross, eminent Shorthorn breeder and importer, has always maintained that his best breeding cows were his best milking cows, a practical observation of the correlation referred to above.

The hog men go all out for this idea. They lay so much stress on the pattern of the sow's udder that the number of sections or teats is stated in the sale catalogues and is always closely scrutinized by prospective buyers as well as in the routine selection of breeding stock. Of course in the gilt or sow the udder is inspected not only to ascertain how many pigs can be suckled but as a guide to the number of pigs to be farrowed (prolificacy) a very definite measure of maternal function. The cattleman is concerned with the welfare of a single calf where the hog man is thinking in terms of a litter.

There is another serious objection to a beef cow giving too much milk, beside the bother of stripping her out after the calf has finished. By the natural law of correlation, beef and milk are opposed to each other so far as production is concerned. The more dairy-like a cow is the less beefy she becomes and vice versa. And this goes for her calves too. A certain cow in the beef herd at the Ohio State University farm demonstrates this fact especially well. She serves a three-fold example to students, i.e., she is the "milkiest" cow in the herd, the lowest rated cow in the official placing of any ring of four that can be assembled out of the herd and the records show her to be the most indifferent breeder.

It is inconsistent to expect a strictly beef cow to give milk in

greater quantity than is sufficient for her calf. To do this is a serious threat to her beef type and the character of her progeny. There are exceptions to prove this rule and the breeders of dual-purpose cattle, especially, have managed well in the breeding of cows of balanced production in both beef and milk but the usual rule is the more milk the less beef. Recognition of this fact is brought out by the frequent reference to the milkiness of a given cow as an apology for her lacking in beef type.

Every beef breeding cow not only should produce a calf but should raise that calf well, two functions that constitute maternity, but no more milk than typifies femininity in its highest form should be expected. If she has the udder development and capacity to grow her calf, and to stamp her a good breeding female, any further emphasis on milk could be skipped by the breeder lest it cost him in beef and in extra labor if his cattle are to be handled by the usual ranch methods.

Feeding the Bred Sow

Condensed from The American Hampshire Herdsman

Dr. S. W. Terrill

Animal Science Dept., University of Illinois

A SOUND program of breeding, feeding, management, sanitation and disease control is necessary for maximum efficiency of the swine enterprise. Breeding herd costs represent about 30 percent of the total cost of producing pork, and feed makes up about three-fourths of breeding herd costs. The feeding and management of bred sows and gilts merit careful consideration.

The feeding of the sow or gilt during gestation and lactation in drylot is considered a nutritionally critical periol. The importance of adequate nutrition during this critical period has been clearly demonstrated. The benefits from a sound feeding and management program for bred sows and gilts include the following: increased litter size, heavier and stronger pigs at birth, greater survival of pigs to weaning age and heavier weaning weights. Unless special provisions are made for rye or winter wheat pastures, most bred sows on cornbelt farms are fed and managed under drylot conditions during the winter.

The ration fed in drylot should contain 14 to 15 percent crude protein, 0.6 percent calcium, 0.4

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percent phosphorous, 0.5 percent salt and adequate amounts of fat- and water-soluble vitamins. The inclusion of high-quality legume hay or meal as 10 to 15 percent of the total ration will usually meet the vitamin needs in rations which include the usual farm-grown grains and supplemental protein from plant and animal (meat, fish or milk by-products) sources. Adequate exposure of the animal to sunlight will meet vitamin D needs. When sows are on *good* green pasture, the crude protein content of the ration may be reduced to 11 to 12 percent and the vitamins may be disregarded.

A gain of 100 to 125 pounds for gilts during the pregnancy period will allow for the growth of the gilt and her litter and will also build up her body reserves of nutrients for the lactation period. Mature sows should be fed to gain about 75 to 100 pounds during the gestation period. The above recommendations should be varied depending upon the initial condition of the gilt or sow.

The feeding of balanced rations to bred sows or gilts consists of supplying the necessary protein, minerals and vitamins that are not furnished by the farm-grown grains. In order to control the rate of gain of bred sows or gilts, the swine producer must either hand-feed the correct amount of feed daily or self-feed a bulky ration. Both methods of feeding have been used successfully. Self-feeding saves labor, whereas hand-feeding requires less feed.

When bred sows and gilts are self-fed, the proportion of bulky feeds in the ration should be governed by the condition of the animals. If they become too fat or gain too rapidly, reduce the amount of corn and increase the quantity of ground hay in the mixture. If the gains are too slow, follow the reverse procedure.

The rations shown here are only examples; other combinations of equal value might be used. When the sows and gilts are grazing *good* legume pasture, the tankage and soybean oil meal may be omitted; whereas on other types of pasture, one-half the amounts of tankage and soybean oil meal should be included in the ration.

The amount of feed to be given daily to a bred female is governed by her age, size and condition. Bred gilts will require about 1.6 to 1.8 pounds of a balanced ration daily per 100 pounds of live weight. Pregnant yearling sows will need about 1.4 to 1.6 pounds of ration per hundred-weight daily and bred mature sows will require about 1.2 to 1.4 pounds of feed daily per 100 pounds live weight. When the complete ration contains 10 to 15 percent high-quality ground legume hay, the upper limits suggested above should be fed. When the legume hay is fed in a rack or the sows

Examples of Rations That May Be Self-Fed to Bred Sows and Gilts

Ingredients	Percentage	
	Bred Sows	Bred Gilts
Ground yellow corn	33.0	31.0
Ground oats	30.0	30.0
Ground alfalfa hay	30.0	30.0
Meat and bone scraps, meat scraps or tankage	4.0	5.0
Soybean oil meal	2.0	3.0
Bone meal or defluorinated phosphate	0.5	0.5
Iodized or trace-mineral salt	0.5	0.5

Sow Supplements

Ingredients	Drylot		Pasture
	lb.	lb.	lb.
Alfalfa, meal, dehydrated	125	100	...
Meat & bone scraps, meat scraps or tankage	75	100	100
Soybean oil meal	100	100	100
Dried corn distiller's solubles	...	100	...
Limestone	...	5	6
Steamed bone meal or defluorinated phosphate	5	...	...
Iodized or trace-mineral salt	5	7	4
Total	310	412	210
To produce a balanced ration, use:			
Corn, yellow, percent	80	77	93
Supplement, percent	20	23	7

and gilts have access to *good* pasture, the lower limits suggested above will be adequate. On the average, a daily allowance of 6 pounds of feed will be satisfactory for either bred sows or gilts in drylot. Any standard will need to be modified in accordance with the gains and condition of the animals.

A fundamental principle of economical pork production is the feeding of properly formulated supplements to balance the home-grown grains. The proper amounts of supplement and grain may be hand-fed daily to bred sows and gilts or the supplement may be mixed in the correct proportions with the ground grain and the entire ration hand-fed in proper amounts daily.

The supplements listed should prove satisfactory if the animals have sufficient exposure to direct sunlight. Many other combinations of equal value might be used.

If bred sows or gilts are being fed in drylot at the rate of 6 pounds of feed per head per day, about 1 1/4 to 1 1/3 pounds of either drylot supplement should be fed per sow daily with the remainder of the daily feed being corn or a combination of farm grains. On pasture, 1/2 pound of the above pasture supplement should be fed per sow daily with enough grain to promote the desired grain.

The importance of excellent green pasture in supplying essential nutrients for swine is not always fully appreciated. Sows

grazing green forage are able to satisfy their needs for certain vitamins and store up reserves of them in the tissues which can be used during a later period when a ration that is deficient or borderline in these essential nutrients is fed. Green pasture also supplies some of the needed protein and minerals as well as affording the opportunity for exercise, and a sanitation program on clean ground. Legume or legume-grass pastures are recommended for summer grazing. Fall-sown rye is recommended for grazing by bred sows and gilts during late fall, winter and early spring.

Bred sows and gilts should be provided with adequate shelter and housing. Bred gilts should be allowed about 11-14 square feet of shelter per head in cold weather and 15–22 square feet of shade per head in warm weather. Bred sows should be allowed about 16–20 square feet of shelter per head in cold weather and 20–30 square feet of shade per head in warm weather.

The sow should be washed and placed in her clean farrowing pen or house several days before she is expected to farrow. At this time her ration should be reduced and made more laxative.

Suggsted Ration to Feed Before Farrowing

Ingredients	Pounds
Ground yellow corn	27.0
Ground oats	26.0
Wheat bran	26.0
Tankage, meat scraps or meat & bone scraps	6.5
Linseed meal	4.0
Alfalfa meal	10.0
Iodized or trace-mineral salt	0.5
Total	100.0

Calves Don't Need Grain

You can raise good calves without grain—if you have plenty of good hay and skim milk. And you can save up to $10 on a calf's feed bill the first six months.

That's what dairymen at the University of Minnesota say after trying it on three sets of identical twins. One twin in each set got hay and skim milk; the other twin got hay and skim milk plus all the grain it wanted, up to 4 pounds a day.

At the end of six months, the calves that got grain outweighed their twins, but it wasn't enough to be important, according to T. L. Gullickson of the Minnesota Dairy Department. He warns, though, that the hay must be top grade.

—Farm Journal

More Power on the Farm

Condensed from The Nation's Agriculture

J. Carroll Bottum

AGRICULTURAL efficiency in the last decade increased more rapidly than in any other period in the history of our country. Two men in 1949 produced as many agricultural products as three men during the 5 prewar years 1935–39. Farm output per hour of labor in 1949 exceeded the 1935–39 output by 51 per cent. Total agricultural production was up 40 per cent in 1949 while the number of people engaged in agriculture was down 9 per cent. More tractors, trucks and machines were purchased during this period than at any other time in our history. Agriculture was really being mechanized.

For the past two decades the increases in output per worker in agriculture have matched the increases in industry. Adapting mechanical power and machines to agriculture so that each agricultural worker might have more power at his command has been the dominant factor making this output possible. With prospects for increased demands on the man power supply of the nation, the importance of combining farm labor with more power and machines continues. The opportunity for profitable substitution of more mechanical power and machines for labor exists on many farms, and new possibilities are continually being developed.

In 1920 there were about a quarter of a million tractors on U. S. farms (table I). By 1930 the number had reached nearly a million. During the next ten years the number of tractors increased by only a little over one million, making 1.5 million by 1940. But, by January 1, 1950, the number had jumped to 3.8 million. If current data were available they would probably show near 4 million.

While this phenomenal increase in tractors was taking place, the number of farm trucks doubled, jumping from a little over 1 million in 1940 to over 2 million by January 1, 1950. During the same period the number of grain combines tripled, the number of corn pickers increased more than three times, and the number of milking machines increased more than fourfold. Corresponding increases in many other mechanically powered machines were also taking place during this period.

Consumption of petroleum fuels by tractors and trucks jumped

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2⅓ times from 1940 to 1948. Total farm consumption of petroleum fuels in 1948 was estimated at about 8.2 billion gallons. It was estimated that 4.2 billion of this was used by farm tractors and trucks. The balance was used by automobiles, stationary and mounted motors and for miscellaneous household and farm uses. In 1940 the fuel consumption by tractors and trucks was estimated at 1.8 billion gallons. Current consumption levels would be much higher.

The number of farms electrified and receiving energy from central power stations increased from 30 per cent in 1940 to 69 per cent June 30, 1948. When data for the current situation are available they will show the per cent of farms electrified to be still higher. This has not only brought farmers a more convenient source of power, but it also has made it possible to substitute mechanical power for human labor for certain tasks about the farmstead.

The significance of these increases in number of tractors, trucks, machines and farms electrified becomes more apparent when we recognize that more than 90 per cent of the total farm products marketed are produced on 3 million of our farms. It was on these more productive units that a high percentage of these machines was purchased. Thus, the degree of mechanization that has taken place when related to total agricultural production is greater than would appear when related to total farms. The use of many of these units for custom work on other farms also increases the percentage of farms on which these new power driven machines are used.

What has this done to agriculture? For one thing, it has made it possible for the 10.8 million agricultural workers in 1949 to produce one-third more products than the 11.7 million workers produced in 1940. It has reduced the percentage of the farmer's time spent on crops, where the greatest amount of mechanization has occurred. Estimates made in 1944 show only 50 per cent of the total farm labor was spent on crops (table II). The other 50 per cent was spent on livestock and maintenance of the farmstead. In the Middle West about 38 per cent of the hours of labor are spent on crops. In the South crop production requires about 61 per cent of the total agricultural hours.

In many areas where farm units are small, mechanization has exerted tremendous pressures in increasing the size of the family farm. While tractors have been developed for farms of various sizes, the problem has been the adjustment of the size of farm to the optimum sized tractor. The great gain from tractor power has been the saving in man labor

rather than the saving in cost of power itself. Therefore, the addition of a tractor which accomplishes only the same work as the team which it displaces results in minor gains. To obtain sufficient acreage to gain the full economies of the optimum sized tractor, farms have to be enlarged in many areas. The size of the commercial family farm is increasing.

Mechanical power and machines have eliminated many back-aching farm jobs such as: shocking grain, corn husking, shoveling grain, pitching hay, loading manure by hand and many others. However, because of the greater volume of business performed by each worker, it has not lessened the hours of work correspondingly. It has changed the type of tasks from hand labor and the directing of horse labor to the operation of power units and machines.

The investment in farm equipment in the United States has increased from approximately 7 per cent of the total farm investment in 1940 to approximately 11 per cent of the total farm investment in 1949. This is a relative increase of approximately 60 per cent. This increase in the amount of power and machinery required in farming today raises considerably the cash investment a tenant or owner must make when he begins farming. It also increases specialization. This heavier investment, combined with the cash outlays for fuel and repairs, plus the increases in many other cash costs, makes the farm business more vulnerable to price changes than formerly. A drop in the prices received by farmers for their products now quickly throws the average farm into a minus net cash position.

The tractor helps to decrease the chances of crop failure. It can not make rain or stop it from raining, but it can help the farm operator to take fuller advantage of the weather when it is right. When the planting season is unfavorable the tractor can be run long hours. This gives greater flexibility and often allows getting the crop planted in a very short time. Many in the corn belt remember the 1947 spring season when the lights of the tractors could be seen almost everywhere until late into the night. Had this not been possible our crop production might have been much smaller. Abundant power helps stabilize production.

In total, the additional power and machines on the farm have meant a more efficient agriculture and a higher standard of living for all of the people of the nation. They have made it possible to release people from agriculture to make industrial products and provide services undreamed of a couple of generations ago. They have helped to make us the most

Table I. Number of Horses and Mules, Tractors, Trucks and Automobiles on Farms, United States, January 1, 1910–49.

Year	Horses and Mules	Tractor	Motor-trucks	Auto-mobiles
	Thousands	Thousands	Thousands	Thousands
1910	24,211	1	0	50
1920	25,742	246	139	2,146
1930	19,124	920	900	4,135
1940	14,478	1,545	1,047	4,144
1941	14,104	1,675	1,095	4,330
1942	13,655	1,885	1,160	4,670
1943	13,231	2,100	1,280	4,350
1944	12,613	2,215	1,385	4,185
1945	11,950	2,422	1,490	4,152
1946	11,063	2,585	1,550	4,150
1947	10,021	2,800	1,730	4,520
1948	9,130	3,150	1,920	4,930
1949	8,274	3,500	2,000	5,250
1950	7,463	3,825	2,200	5,800

Source of Data: Bureau of Agricultural Economics, USDA.

productive nation in the world. They made us strong as a nation in time of emergency because such a small percentage of our population is required to feed us as compared to most other nations.

From 1940 to 1949 farm wage rates went up 3⅓ times. During the next several years the demands upon labor appear likely to keep farm hired labor rates high relative to other costs. It appears likely that agriculture will continue reasonably prosperous. Both of these situations are conducive to further mechanization and adoption of labor saving devices. Further increases in power and machinery will continue to the extent that equipment is available.

Not only will mechanization and the great use of power continue in the production of crops, but its use will increase even more in performing the jobs about the farmstead. It will be used more in moving water, grain and roughage to livestock. More barns will be cleaned by power. Custom machines will do more of the ditching, the painting, the fence building and the other specialized tasks about the farm.

The problem of each individual farmer is just how far to go in mechanizing his farm. Under what situations should he buy a grain combine, a corn picker, a cotton picker, a hay baler or chopper, a weed sprayer, a truck, a second tractor? How many of these operation should he hire done? How many operations should he continue to do as he is now doing? Can an arrangement be worked out with the neighbor so that one man owns the corn picker and one owns the combine and they exchange work with each other? In deciding which way to go, one must figure the annual added costs if the machine is purchased, and the savings. In

figuring these costs, interest, taxes and depreciation must not be overlooked. With equipment now involving 11 per cent of the total farm investment, a farm can be over-mechanized from the standpoint of greatest net return. Information on the cost of operating machines can be obtained from most agricultural experiment stations.

Further mechaniaztion will continue to increase the need for an economical size unit, on which modern power and equipment can be used efficiently. It is largely the increased production of grain and livestock per man that make mechanization pay on the farm. Therefore, it is important that the farm operator purchase the most suitable size machines for his area, and then adjust his volume of business to them. The purchase of a one-plow tractor may make it possible to mechanize the plowing operation, but the farmer is still plowing one furrow where his neighbor may be plowing two or three with a larger tractor. The same problem applies, to a lesser degree, to the other operations. The pressure to enlarge farms will continue, because it is volume of output per hour of labor in agriculture, the same as in industry, that counts. Each farmer must continue to increase his output if he wishes to hold his relative economic position in society.

Table II. Estimated Man-hours of Labor Required for Farm Work, United States, 1944. Sourse of Data: Bureau of Agricultural Economics, USDA.

Type of Work	1944	
	Number of hours *Millions*	Percentage of total *Percent*
Crops	10,547	50.5
Livestock	7,277	34.9
Farm Maintenance	3,053	14.6
All Farm Work	20,877	100.0

Profit

One cow producing 400 pounds of butterfat annually is worth 4 that deliver only 200 pounds, according to Nebraska herd improvement records. The 400-pound cows returned $266 above feed cost. Those delivering half as much fat netted $59 over feed expense. It cost $41 more to feed the good cows, but these returned $207 more.

—Cappers Farmer

Be Your Own Woods Boss

Condensed from The Rural New-Yorker

John F. Preston

ONE of the principal difficulties encountered by farmers in the management of their woodlands is the profitable sale of wood products. Part of the difficulty is a lack of knowledge of the wood market and a hesitancy to learn the business of growing and selling wood products. If farmers would accept the fact that a good growing business exists on their farms, for the reason that a certain farm acreage is covered by forest trees, and take steps to learn how to develop the business, much of the difficulty would disappear.

It is assumed that the farmer wants to manage a wood crop and market what is salable, at the same time gradually putting his woods into condition to grow large volumes of the higher grades of wood. He wants to know what his stock of goods is worth, what portion it is safe to hold for future sale and what profitably can be sold now. He also may want to know what products (and trees) should be removed now, at no profit or even at a loss, for the sake of greater future profits. In short, he needs an inventory of his woods stock in terms of trees, their condition, and the products they will make. He needs a corresponding inventory of the local wood markets, including the specifications of products in demand and the prices offered at specified delivery points. With this knowledge he can decide what he is willing to sell and what he can sell. The next step is to decide how he wants to sell those products that he can dispose of and that he is willing to sell. Also, how much of the products in his woods he can afford to sell at no profit or even at some loss.

How can he start on such a program? Most State foresters have a staff of field men known as farm foresters. These men are usually stationed at strategic points throughout the State. Their job is to help farmers with the tasks enumerated above. Their services are free. They are not expected to do the work required, but to teach farmers how to do it themselves. The first step, then, is to write the State forester and ask for the assistance of a farm forester. Another approach is through the county agent who will know how to get technical help if it is available. In a few states, the

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farm foresters work under the direction of the Extension Service.

In the absence of such help, or supplementary to it, the farmer has the opportunity of employing a consulting forester who will inventory his woods, prepare a plan of cutting and assist him in selling those products that are ready for sale and have a market value. For this service the farmer must pay a fee but, if he has a reasonably good woods or a big woods (50 or more acres), the service is well worth the fee. Some consulting foresters will handle the whole job of cutting each year or periodically for a percentage of the gross selling price. The State forester will furnish farmers with the names and addresses of reliable consulting foresters.

These are the relatively easy ways of managing a farm woods and selling its products but they are not the only way. In any case, if the farmer is to make a success of growing wood as a farm crop, he must learn how to do it just as he learns how to grow and sell other farm crops. In the long run, he will make more money if he learns how and conducts the business himself, than if he depends on an agent. If he is at all interested, he should take advantage of the public assistance available and through this means, plus the published literature available, become the manager of his own wood crop.

The most important step in the successful and profitable marketing of salable timber and wood products is the decision to manage one's own woodlot. Successful marketing of wood is closely related to successful management. This is true not only of wood crops but of other farm crops. Farmers can, because many are already doing it, handle wood crops as they do other farm crops. In other words, they sell processed products, not standing timber. They sometimes do all the work themselves or with hired labor; sometimes they contract for part of it. For example, they may contract the felling of the trees and bucking them into logs and do the skidding with farm horses or tractors. They may sell the logs or other products at the roadside or deliver them to the railway or mill.

The surest way to insure the destruction of the woods as a source of revenue is to sell all or part of the standing timber and let the buyer go in and help himself. Even if the sale is on the basis of scale or measurement of processed products, instead of a lump sum payment, the result in wrecking the productive power of the woods is equally bad. Sales should be based on trees selected and marked by the owner, cut and made into products and the products sold to the buyer. Thus the seller has complete control of the

operation. He will then remove only trees that are ready to be cut, either because they have reached their maturity or because their removal will release thrifty younger trees ready to grow bigger in size and value.

If a farmer undertakes to sell products instead of standing timber, he normally will produce relatively few products each year or every two or three years. His cutting will be on a small scale. He will learn not only how to cut and process products and how to sell them, but how to select trees for removal. He will learn how to harvest his wood crop and keep plenty of trees growing to produce future wood crops. In short, he will soon learn by practice how to manage his woodland and he will get a new joy out of doing it.

Selling products instead of standing trees (stumpage) produces more revenue to the seller because not only does he get paid for the labor and machinery used but he collects the profit on the operation that would otherwise go to the middleman. The South Eastern Forest Experiment Station recently reported the results of a four-year operation (1946–1949) in a 303-acre southern woodland. Using equipment available to the average farmer, the gross return for products sold, cut and hauled to the mill, averaged $11.36 per acre each year. If stumpage had been sold, the return to the farmer would have been $3.23 per acre each year. Of course, there is more possibility of loss as well as profit in selling products instead of stumpage. That is true of other farm operations too. There is less risk in selling corn in the field or in the crib than in feeding it to livestock and selling the animals. All farmers do not have the time, physical ability or inclination to engage in woods operations. But the selling of products and the careful management of the woods, that it makes possible, is the best way to make a farm woodland pay its share of the farm income.

Many farmers will find, if they do not already know, that they have products in their woods that they cannot sell at all and others that cannot be sold at a profit. The wood market normally is glutted with low grade products —fuel, posts, railway ties, some mine timbers and low grade sawlogs. That is because the woods are full of such products. The reason for that is because the kind of woods management that has prevailed in the past has reduced the woods growing stock to a point where high class products are absent. The cure is to change the management. Gradually build up the growing stock in sizes of trees and the better species that will enable the woods to produce each year a larger percentage of high grade products.

In the meantime, the woods manager of a rundown woods must make the best of a bad situation. He should begin cutting on a small scale, using it on the farm and selling additional products for which he has found a market. It is easy to become discouraged. Wood markets, however, have a way of changing rapidly. Trees and products that are a drug on the market today are often in demand tomorrow. Also, there are ways of developing a market for some low grade products that enable the woods manager to dispose of them in spite of poor first prospects. Persistence and patience are required. Knowing how and what to sell is an important part of timber growing. It cannot be learned in one season; neither were other parts of the farm business learned in a single season.

The surest road to success in marketing wood is to learn woods management and wood marketing together. A slow beginning, usually best in any new undertaking, is particularly true in woodland management. Large mistakes in cutting take years to correct; small ones are not serious largely because the forest manager learns from the experience how to do better.

No Wire Brush

Wire brushing of rusty galvanized roof, preparatory to painting with metallic zinc paint, appears to be economically unsound as well as time-consuming and laborious, according to actual farm tests recently concluded by the American Zinc Institute. Instead, its field engineers report, thorough brushing with a stiff-bristled fiber push broom to remove loose rust and scale gives a surface on which a single coat of the zinc paint—brushed or sprayed—will endure five to six years in ordinary rural atmospheres, two coats for 12 years or more.

From the tests it appears that wire brushing fails to increase service life enough to justify the added expense in time and labor.

—New Jersey Farm & Garden

Saving Feed Dollars

Condensed from the Poultry Tribune

H. R. Bird
U. S. Department of Agriculture

Did you ever hear of a poultryman buying a market egg mash and using it as a breeder mash? If you know many poultrymen, you probably know some that follow this practice.

Failure to follow directions in the use of commercial manufactured feeds is a serious hindrance to the application of up-to-date knowledge of poultry nutrition.

Only a few years ago there was considerable support for the all-purpose mash which could be fed to starting and growing chicks, to flocks producing market eggs, or to breeders. It is still possible to formulate a mash that is satisfactory for all purposes from the nutritional standpoint, but it cannot be satisfactory for all purposes from the economic standpoint.

It is impossible to make a mash that is nutritionally adequate for the production of hatching eggs, and at the same time economically sound for market egg production. It is impossible to make a mash that is adequate for starting chicks, and also economically sound for growing pullets on range.

If we are to apply the known facts to give the poultryman the greatest return for his feed dollar, we must have starting mashes, growing mashes, commercial broiler mashes, market egg mashes, and breeder mashes. All of these are made up of grains, protein supplements, mineral supplements, vitamin supplements, and (except in some egg mashes) alfalfa meal.

Feeds for starting chicks, growing pullets, and broilers do not necessarily differ among themselves with respect to their mineral supplements or their content of alfalfa meal. They should differ in their grain components and their protein and vitamin supplements.

The starting mash should contain relatively little oats, barley, and millfeeds. Its protein supplements should supply vitamin B_{12} as well as protein. Therefore, it should include at least 2 per cent of fish meal or 4 per cent of meat meal, assuming that an additional vitamin B_{12} supplement is provided. It should contain enough soybean meal to bring the pro-

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tein content of the mash to 20 per cent. However, part of the soybean meal may be replaced by corn gluten meal, cottonseed meal, or peanut meal. It should contain a riboflavin supplement and a vitamin A and D supplement.

All these same specifications apply to a broiler mash, except that it should contain at least 4 per cent of fish meal or 8 per cent of meat meal besides a vitamin B_{12} supplement. Broiler mash should contain an antibiotic supplement, and for the sake of skin pigmentation, it should contain 5 or 10 per cent of corn gluten meal, which is merely optional in the starting mash.

In growing mashes for pullets on range, much greater quantities of oats, barley, and millfeeds may be used if it is economical to do so. The protein supplement may consist entirely of soybean meal in sufficient quantity to bring the protein content of the mash to 18 or 20 per cent. Soybean meal is almost always cheaper than meat and fish meals. Vitamin B_{12} and antibiotic supplements are unnecessary. If very good pasture is available, the riboflavin supplement and vitamin A and D feeding oil may be omitted.

Market egg mashes and breeder mashes may be very much alike in the grains and minerals they contain. Breeder mashes need a manganese compound and market egg mashes don't. The cost of the manganese is so low that there is no reason to exclude it from the egg mash. The breeder mash needs either fish meal or meat meal plus a vitamin B_{12} supplement.

In my opinion, these add unnecessarily to the cost of a market egg mash, which needs no protein supplement other than soybean meal. Although many will disagree with the preceding statement, there is believed to be general agreement that the vitamin B_{12} supplement could be omitted and the level of meat meal or fish meal reduced in the egg mash below the level needed for breeders. The breeder mash also needs more riboflavin than the egg mash, but at present prices this difference has little effect on feed cost.

When the composition of feeds for breeders and for producers of market eggs is discussed, someone nearly always asks: *"Shouldn't flocks producing market eggs be fed just as well as breeders in order to produce eggs of the highest nutritive value for human consumption?"* The answer to this is that any feeding program that gets the maximum number of eggs produces eggs of high nutritive value.

It is true that the quantity of certain vitamins may be increased by feeding a breeder mash, but the owner of a flock producing market eggs cannot be expected to pay for these extra vitamins,

which do not increase the selling price of his product.

You may have noticed that so far no comparison has been made of feeds for mature stock and feeds for young birds. There are many all-mash starters that could be fed successfully to breeders, with whole grain and limestone grit. There are also breeder mashes that could be fed as all-mash starters, although they might be rather high in calcium. It is believed, however, that this interchange is not often attempted.

Just a few days ago a nutritionist employed by a large feed manufacturer asked if it's really worth while to make both market egg mash and breeder mash. He said, "We know there are lots of owners of breeding flocks that use our market egg mash. Why make two mashes?" Owners of breeding flocks are tempted to use market egg mashes even during the hatching season because they're cheaper.

On the other hand, feed manufacturers are afraid to formulate egg mashes with a view to maximum economy because they know they're being fed to breeders. The result is likely to be a compromise mash that is more expensive than an egg mash should be and not well enough fortified nutritionally to be a good breeder mash. The producer of market eggs pays too much for feed. The breeder gets a feed that isn't good enough, and then everybody loses.

A similar example is provided by growing mashes. Many pullets are grown on good pasture. For the sake of economy, they should be given a low-cost mash, especially designed to be used with good pasture. But can a manufacturer afford to make such a feed? He knows that its low price will tempt some people who are raising pullets on bare range. If they feed it under their conditions, results are likely to be disappointing. Poultrymen sometimes have been known to blame feed manufacturers for their disappointments. The feed man is tempted to make his growing mash adequate for birds on bare range. As a result, it is overfortified for birds on good pasture, and some of the economies that are possible with good pasture are not realized.

Feed formulas are prescriptions. They must be made for specific purposes and used for those purposes, according to specific directions. Only by doing so can we apply what we know about feeding poultry.

Renovation Boosts Pasture Yields

Condensed from The Maryland Farmer

RENOVATION of old permanent dairy pastures at the Agricultural Research Center, Beltsville, Md., in 1945 resulted in an average yearly increase of 35 per cent in feed nutrients during the next 5 years, according to the U. S. Department of Agriculture.

"In other words," say J. B. Shepherd, dairy husbandman for the Bureau of Dairy Industry, "for the past 5 years our renovated pastures have had a potential milk-producing capacity for 35 per cent more than the unrenovated pastures with which they were compared in these experiments."

The renovated pastures not only provided more grazing than the unrenovated pastures, but they furnished more grazing earlier in the spring and later in the fall. Furthermore, from July 15 on, when permanent pastures are often short, the renovated pastures outyield the unrenovated pastures by an average of 45 per cent each year for the 5 years.

Plant population counts were made each fall by agronomists of the Bureau of Plant Industry, Soils and Agricultural Engineering, who cooperated in the renovation experiments. They found a progressive decrease in legume content and an increase in grass and weed content, so that in this respect the renovated pastures are now similar to the unrenovated pastures.

According to the agronomists, this shift from legumes to grasses lowers the protein content of the pasture herbage, and for this reason they conclude that renovation at Beltsville should be repeated soon after the fourth year. This would prevent unfavorable changes in the botanical composition of the pasture and a dropping off in total yield.

To start the renovation experiments, several permanent, better-than-average pastures on tillable land were treated with manure and lime and then torn up with a heavily weighted disk harrow in the fall. The cut-up sod was left on the surface as a protection against erosion. Early the following spring, 500 pounds per acre of an 0-14-14 fertilizer was broadcast, and the pastures were double disked, then harrowed again before being reseeded with a mixture of 8 pounds of bromegrass, 8 pounds of alfalfa, 3 pounds of red clover, and 2 pounds of Ladino clover per acre. The renovated pastures were culti-packed after seeding and received no other

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Baltimore, Maryland, December, 1950

treatment during the 5-year period except for another 500 pounds of 0-14-14 fertilizer in the spring of the second year.

For comparison purposes, a part of each original pasture was not renovated, but received the same fertilizer treatment as the renovated pastures.

The average yield in pounds per acre of total digestible nutrients from the renovated pastures was: First year, 2,016 pounds; second year, 4,155 pounds; third year, 3,967 pounds; fourth year, 4,142 pounds; and the fifth year, 3,797 pounds. The 5-year average per-acre yield for the renovated pastures was 3,617 pounds of total digestible nutrients as compared with 2,687 pounds for the unrenovated pastures,—or an increase of 930 pounds of total digestible nutrients per year.

This increase, which amounted to 35 per cent, is equivalent to 1,860 pounds of good hay, and is about equal to the total production of feed nutrients from many pastures of low soil fertility.

How to Buy Mixed Feeds

Condensed from the Farm Journal

Frank B. Morrison
Cornell University

Did you ever wonder, when you buy a commercially mixed feed, whether you're getting the one that will give you the most for your money? There's a *big* difference in what you can get with your feed dollars.

There's so much talk these days about carbohydrates, vitamin B_{12}, amino acids, and the like, that it's no wonder that many stockmen get so confused with the whole thing that they just buy a feed that looks and smells good, and hope for the best.

But you don't have to be a scientist to read a tag on a bag of feed and get the essential information. There are a few important things to look for, and I want to tell you what some of them are.

First, though, let me emphasize three things:

1. Feeds with flexible formulas are usually the best buy.

The prices of feed ingredients —with about the same food value —vary a good bit in price, from one time to another. A good feed manufacturer will shift his formulas as the prices change, to give you the most for your money.

Be wary of the formula that never changes. There is no *one*

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best ration. If substitutions are made wisely, the price of a mixed feed can be kept down, and you'll still get just as good results.

2. It pays to read that feed bag. Most states require that mixed feeds carry a tag that guarantees the ingredients, and the chemical make-up of the feed.

The feed in the sack must have at least as much protein and fat as is shown on the guarantee. The fiber—the least valuable part of the feed—can't be any higher than the guarantee. The more protein and fat the better, and the less fiber the better.

3. Learn the reputation of the different feed manufacturers for making high-quality mixed feeds.

How can you do that? You can get the reports from the department in your state that is in charge of enforcing your feed laws. Some states charge a small amount for these bulletins or reports, others send them free. These reports will tell whether the feed has met its guarantees.

Ask your neighbors what luck they have had with a feed, and whether it is dependably high-grade each year. Compare it with another feed or feeds if you can.

Now let's look at feeds for different kinds of livestock:

Cattle Feed

A good cattle feed will have a large proportion of the high-grade feeds listed below. If wheat, bran, and cane or beet molasses are used in no more than usual amounts, you can add them to the high-grade group.

Wheat bran is tasty and gives bulk to a concentrate mixture. Molasses keeps down dust, makes the feed tastier, and binds it together to cut down waste during feeding.

A good dairy feed doesn't have to be made up of a great number of complex feeds. In fact, it is difficult to improve on a simple mixture of ground corn, ground oats, wheat bran, salt, a phosphorus supplement (if you need it), and either linseed meal, cottonseed meal, or soybean oil meal, in amounts to give you the protein content you need.

The right amount of protein is the thing to shoot for in a feed mixture for dairy cows. Let's say your cows are getting good mixed hay containing at least one-third legumes, along with as much corn or sorgham silage as they will eat. A mixed feed with about 18% protein will do the rest.

With nearly pure alfalfa hay and corn or sorghum silage, a 12% protein mixture will do.

If your cows get little or no legume roughage, you'll want a grain mixture with 20% to 24% protein.

High-grade mixed dairy feeds usually have a fiber guarantee of not more than 9% or 10%.

Actually, a good mixed feed may run a full 1% or more below the minimum guarantee.

When a dairy feed has a fiber guarantee of 12% or more, it is likely to carry some low-grade ingredients. Before you take this feed, check the feeding value you get *per dollar,* as compared with a higher-grade feed that costs more.

Hog and Poultry Feeds

A good hog or poultry feed has plentiful high-quality protein that contains the "essential" amino acids. These amino acids are the "building stones" from which proteins are made.

Cattle and sheep can make the necessary amino acids out of poorer quality proteins. The bacteria in their paunches can even make good protein out of simple nitrogen compounds such as urea or ammonium salts. Farther down in the digestive system, the cattle or sheep digest the bacteria and get a "square meal" of good protein.

But hogs and poultry can't do this—they have different kinds of stomachs. Hence you need to give them feeds that already carry the essential amino acids.

Since corn and other cereal grains are lacking in some of the amino acids, you'll need to add such feeds as dairy by-products, meat scraps, tankage, fish meal, or soybean oil meal.

Don't discount feeds for hogs, poultry, or calves when the mixture contains only a small amount of legume hay. It is sometimes needed as a vitamin supplement, especially when the animals aren't on pasture. But you need only a little. Watch out that more isn't added just to make bulk.

How About Vitamins?

Vitamins are important, but are often over-sold. All good pasture is rich in carotene, which is what animals use to make vitamin A. During the pasture season they *store up* considerable amounts of vitamin A. They can draw on this supply during the winter if their rations are short in carotene.

Your livestock will have enough vitamin A, even in winter, if they get roughage of reasonably good quality. Green-colored hay is generally rich in vitamin A, and good silage is even higher.

Cattle and sheep ordinarily don't need any vitamin B supplements. They make their own.

Hogs and poultry do need the B-complex vitamins in their rations, because they can't form much of these vitamins in their digestive systems. Poultry mashes, therefore, usually carry special vitamin-B-complex supplements, especially riboflavin. These supplements are also often included in mixed hog feeds and supplemental mixtures for hogs.

There is great interest nowadays in adding vitamin B_{12} and

antibiotic supplements to poultry and hog rations. In my opinion, it is still too early to decide just how necessary or profitable such additions are to ordinary good rations.

Plenty of vitamin D is furnished by the usual rations for cattle and sheep, plus the supply they make in their own bodies when exposed to sunlight.

Ordinary rations supply plenty of Vitamin E, the fertility vitamin.

The more you learn about feeds, the easier it is to see that making or buying a mixed feed isn't always a simple thing. But neither is it so complex that these handy rules won't help you get the most for your money.

Let me emphasize again: in buying commercial feeds, *look at the tag.* Don't buy until you do. That one thing can save you an important amount of money in a year's time.

High-Grade Feeds

They cost money, but they're worth it. They are easy to digest, high in energy for making meat or milk.

Look for these well-known ingredients, *rich in feed value, although low in proteins:*

Farm grains.
Hominy feed.
Corn feed meal.
Dried beet pulp.
Citrus pulp.

Look for these common ingredients, *rich both in feed value and proteins:*

Linseed meal, cottonseed meal, and soybean oil meal.
Corn gluten feed and meal.
Distiller's dried grains.

Low-Grade Feeds

They are high in fiber and hard to digest. They won't make much milk or meat. Look out for these:

Oat hulls.
Oat mill feed.
Chaffy or refuse grain screenings.
Soybean mill feed.
Linseed feed.
Flaxseed screenings oil feed.
Ground corn cobs.
Rice hulls and chaff.
Peanut hulls or shells.
Ground hay, unless needed as a vitamin supplement.

Blue Lupine—King of Cover Crops

Condensed from The Progressive Farmer

George H. King, Associate Director
Georgia Coastal Plain Experiment Station

As far as the farmer of the Coastal Plain is concerned the blue lupine may well be called the "King of Soil Improvement Crops." Roughly speaking, a ton of green lupine returns to the soil about 8 pounds of nitrogen, or the equivalent of 50 pounds nitrate of soda. Since green weight production often yields from 20,000 to 30,000 pounds, blue lupine returns to the soil from 80 to 120 pounds of nitrogen, or the equivalent of from 500 to 750 pounds nitrate of soda.

Since this is an organic form of nitrogen, effects may be seen for years. It is recognized, certainly, that quick-acting forms of commercial nitrogen may be profitably applied to crops even after a heavy crop of lupine. This gives crops stimulation during critical periods of growth. The organic nitrogen from lupine, as it slowly becomes available, holds the crop through periods of drouth and causes growth to be vigorous until the crop reaches maturity, thus insuring increased yields.

The value of blue lupine as a cover crop preceding corn is well known. Doubtless, much of the increased per acre production of corn in the Lower South can be credited to increased planting of lupine. E. D. Alexander, extension agronomist for Georgia, says, "It is more than coincidence that Georgia's average corn yield has increased from 12 to 18 bushels per acre in the past nine years, while the acreage in lupine has increased from practically nothing to over 800,000 acres during the same period of time."

What is not so generally well known is that lupine is one of the best sources of nitrogen fertilizer for pasture. For several years at the Georgia Coastal Plain Experiment Station pasture, specialists have been seeding lupine in September and October at the rate of 50 to 75 pounds of seed per acre on Bermuda grass sod. Over a three-year period, agronomists of that station have found that the yield of dry Bermuda grass hay is increased 2½ to three times by the planting of lupine. How valuable a source of nitrogen it is may be seen from these results in 1949:

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Birmingham, Alabama, September, 1950

Treatment	Pounds Bermuda Hay per Acre	Increase Over Check
No nitrogen	2,550	
Lupine disked in ..	6,700	4,150
100 pounds nitrogen from nitrate of soda (600 pounds approximately) .	7,400	4,850

The practice followed is to have Bermuda grazed closely or mowed. Lupine seed is disked in lightly. The following March, when in full flower, green lupine can be disked into the sod. If the grower prefers, he may let the lupine remain until seed matures. Seed may bring enough to pay expenses. About the only nitrogen lost is that going into the seed as protein. A disadvantage of disking under green lupine is that the operation delays grazing for about three weeks because of damage caused the Bermuda. Where left for seed, cows cannot graze Bermuda satisfactorily until lupine seed is harvested. The seed crop, however, should more than pay the cost of delayed grazing. After lupine seed is combined, the cattleman is assured of a rich, lush growth of Bermuda until frost.

Another desirable practice is to plant lupine in the fall on land where Bermuda grass is to be planted the following spring. The lupine can be harrowed under in spring three or four weeks before Bermuda sprigs are set.

Lupine has become popular because of its heavy yield of forage and seed, adaptability to various soils, clay, or sand, and because vegetation is easily worked into the soil. Ease of planting has also been an important factor in its popularity. A good stand of lupine can be secured in the Coastal Plains area by observing the following practices:

There are three steps to securing good stands. First, land should be prepared in September by plowing or disking. It is very desirable for good inoculation and germination to have a rain between land preparations and planting.

Second, lupine should be planted in late September or early October. Seed at the rate of 60 to 75 pounds per acre. On fields where previous crops have been well fertilized, no fertilizer is necessary. Lupine seed and fertilizer should never be drilled at the same time, because fertilizer will injure inoculation. Seed should be planted about 1½ inches deep. A grain drill is recommended, but broadcasting and plowing or harrowing seed in works well if seed is not covered too deep.

Third, inoculation is absolutely necessary. Without it, lupine's growth may be reduced by one-half. Even then, nodules are not formed to produce nitrogen, so that the purpose for which lupine is planted is defeated. Proper

inoculation consists of taking the required amount of commercial material and wetting it to form a thin paste. This is then placed on lupine seed in a sack only about one-third full. Inverting and rolling the sack of seed several times will get inoculant over seed. Adding a tablespoonful of syrup to the paste is recommended by some to increase the ability of inoculant to stick to seed. Seed should be inoculated just before planting, preferably not longer than two or three hours. Inoculated seed should never be exposed to sunshine or allowed to dry out after inoculation.

Harvesting a high quality seed is very important. Lupine seed matures about the same time as oats, or in late May and early June. Combining seed is the most common practice. Seed should not be harvested until maturity is reached. By this time, some of the seed will have shattered. Some shattering is preferable to harvesting with too much moisture in seed. Even under the most favorable conditions, lupine seed usually contains about 15 per cent moisture. This is too high for storage. Except for small lots, which can be quickly dried by spreading, it is advisable to send lupine seed at once to an artificial drying plant. Seed should be dried down to around 12 per cent moisture. Lupine seed does not carry over from one year to another under average storage conditions.

No crop is grown that does not have some shortcomings. Lupine is no exception. Anthracnose and brown spot attack the growing plant and seed pods. These diseases are carried on and in the seed. Several stem rots, Fusarium sp., Pythium sp., and Rhizoctonia sp., may cause loss. Sclerotinia stem rot and Botrytis blight often cause damage. These fungi live from year to year in the soil. A virus disease causing stunting and barrenness also occurs. Seed treatment has been tried and may prove to do some good. It cannot be considered the answer to lupine disease control. Disease-free seed that has been properly cured and stored seems to be the best solution. Lupine is susceptible to nematodes to some extent, though probably less than winter peas or vetch.

Lupines should not be planted preceding crops such as tobacco, tomatoes, melons, peppers, or such crops that have diseases in common with lupines.

Sprayer Speedometer Insures Accurate Job

Condensed from Better Farms

Wesley W. Gunkel
Cornell University Experiment Station

With widespread use of the concentrate orchard and field sprayers, the application of sprays has become more critical. No longer can the words *approximately* or *about* be used when determining the rate of spray application. It is essential for both economical and control purposes that the correct amount of insecticide, fungicide or herbicide material be applied per acre or tree. This rate of application can be controlled at four critical points: 1. Amount of active ingredients added to water. 2. Rate of discharge of spray material in gallons per minute. 3. Spacing of trees or rows. 4. Speed of the sprayer.

The first three are very easy to determine and control, but the fourth is usually left to chance. Most tractor operators have certain notches on the throttle for the various speeds desired. This kind of driving is inaccurate and certainly not reliable. Observations and tests made by the agricultural engineers at Cornell have shown that if the tractor operator guesses at the speed, he can be off by as much as two or three miles per hour.

As a typical example, if a sprayer operator wanted to apply 10 gallons of spray per acre, and from the discharge determined he would have to travel at 3 miles per hour, and if instead, he traveled at 2 miles per hour his actual rate of application would be 15 gallons per acre. This higher rate of application would increase the cost of material by ½ and could also cause severe damage to the crop.

The only way the forward speed of the sprayer can be accurately determined and controlled is by a speedometer, preferably mounted on the sprayer in full view of the operator. In this type of mounting the speedometer is connected to one of the sprayer wheels by means of a flexible cable, the sprayer wheel serving as the indicator. If desired, the speedometer can be mounted on the tractor and connected to a separate indicator wheel.

The speedometer should be calibrated from 0 to 10 miles per hour on full dial movement. If the

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Pulaski, New York, November, 1950

sprayer is to be towed on the road at speeds greater than 10 miles per hour, some method should be used to disengage the speedometer while towing.

If the operator has adequate "know-how" and shop facilities, he can construct a homemade sprayer speedometer from a standard car or truck speedometer. In one homemade unit, the speedometer head, flexible cable, wheel and tire, and sprockets and roller chain were purchased from a mail order house; the flexible cable adaptor and strap irons from a junk yard. The proper ratios were determined by the Department of Agricultural Engineering so that the speedometer registered 10 times the actual speed, or when the speedometer reads 20 miles per hour the correct speed is 2 miles per hour.

The easiest, and no more expensive, method of obtaining a sprayer speedometer, however, is purchasing one from a company that manufactures special tractor and speedometer assemblies. This speedometer assembly consists of a speedometer head, flexible cable, gear reduction unit with fiber gear, and bronze mating gear that attaches to the indicator wheel. When ordering an assembly, the only information that the company needs is the length of flexible cable desired (20 ft. maximum) and radius of the indicator wheel.

Whether a sprayer speedometer is homemade or purchased, mounted on the tractor or sprayer, the cost is incidental to the total savings made possible by its use.

New Chemicals for Defoliation

Condensed from Better Farming Methods

Lou Childers
United States Department of Agriculture

EVERY year brings changes in the techniques of chemical defoliation of cotton. The 1950 season was no exception.

Rapid changes in this technique are probably to be expected for a number of years to come. Defoliation science is still young. Knowledge concerning the basic processes involved in the induced shedding of leaves is still expanding rapidly. So is our information on other phases of defoliation.

Various new chemicals, for example, are still under extensive test and others are being screened to determine their possible usefulness.

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Mount Morris, Illinois, January, 1951

Development of spraying and dusting requirements relating to equipment as well as design and improvement of the machines themselves to do the application job are just getting well under way.

Despite the many unknowns, rapid advancements are being made. It should be remembered that while chemical defoliation is not a recent discovery, it has only been in the last 12 years that it has become a useful agricultural tool.

Previous to 1938 scientists and farmers had observed that pulverized calcium cyanamide fertilizer being applied to cotton sometimes caused defoliation. This was especially true when it drifted onto leaves wet with dew. In that year research men in South Carolina, experimenting with this material and a dusting grade of the same chemical, found that complete defoliation could be obtained within 7 to 10 days, with rates as low as 10 pounds per acre.

Even so, this new knowledge was not put to immediate practical farm use. At that time there was no pressing need for the process of defoliation as an aid to mechanical harvesting.

It was the successful development of mechanical harvesters for cotton that really got defoliation started. Early in the use of these machines it became apparent that their successful use would depend in part on the elimination of the trash and leaf stain in machine-harvested cotton. Such trash tended to lower its grade and value.

Progress in use of defoliation by farmers has followed closely that of research. New practices were sometimes adopted before tests produced conclusive results.

At present, no one knows exactly the extent of the acreage on which defoliants are being used. Informed estimates indicate, however, that in California last fall around 25 per cent of the crop was defoliated chemically. In Arizona, defoliants were probably used on that much or even more of the crop.

Nationally, the percentage probably amounted to 10 per cent or more. In the West, applications are made almost entirely by airplane. In the East this method also predominates, with ground application expanding.

One of the recent developments is the advancement in new defoliating chemicals. Several other trends also were noted by research scientists on this work in the Cotton Belt this past fall.

In the Southeast, it has become increasingly apparent that farmers can prevent most of their losses from boll rots by proper defoliation. The additional light and aeration provided in rank cotton, where boll rotting fungi attack

the bolls in wet seasons and often render the fiber worthless, is one of the major benefits of the practice in the region.

Farmers have known this for a number of years. Conditions were such this past summer and fall that many who had given little consideration to defoliation "rediscovered" its importance. An increasing number are now coming to the view that defoliation is good insurance. They are ready to include it as a regular part of their production practices.

For several years calcium cyanamide was the only defoliating chemical available. It is still the dominant material in the humid parts of the Cotton Belt and at this time seems likely to continue to hold this position.

Other materials are coming into the picture. They are used as a supplement to cyanamide, for use during periods of drought, or when there is little dew.

Farther west the use of calcium cyanamide has always been limited. This was because of the lack of dews or light rains during times when defoliation is most desirable. Here, instead of only one defoliant, it now looks as if growers will be faced with a choice of several. Each will do a better job at a specific time of year or under specific conditions.

Scientists on defoliation look for farmers in the more arid regions to continue to find use for calcium cyanamide for defoliating, especially early in the season when morning dews are common. Later, as the season advances into the period when there is little dew, hygroscopic dust may come in to do a better job.

At present, however, only one such dust—monosodium cyanamide—is being marketed. Used as a dust, it has the capacity of drawing enough moisture from the air to liquefy and then penetrate into the leaf cells at or near 50 per cent relative humidity.

Gradual or increasing dryness of the soil, air, and plants is a characteristic of irrigated cotton regions. Here, as the plants grow to maturity and become slightly drier, the chlorate-borate mixtures are likely to be useful. For example, sodium chlorate with sodium pentoborate.

Sodium monochloroacetate has proved a little more effective than these mixtures in moisture-stressed cotton. All are applied in water as sprays, so are effective in the absence of dews.

As the cotton plants become extremely mature, chemicals that produce more leaf injury will prove useful. At present, these include ammonium thiocyanate and potassium cyanate. They also are applied as water solutions.

As a final step in defoliation, oil-base defoliants are showing

promise. These are used after the water-soluble chemicals are no longer efficient because of extreme drying of the cotton plants when fully mature. Under such conditions farmers in the arid regions are likely to find them very useful. They are now recommended only for use on fully mature plants.

The entire matter of defoliant application rates is dependent on location. Rate is specifically dependent on weather. It is also very dependent on amount of foliage, plant activity, and stage of maturity.

Manufacturers' recommendations provide a good general guide based on widespread experimentation. Local agricultural leaders and growers should also consult defoliation specialists carrying on experiments in their own state or general locality.

All in all, defoliation is here to stay and expand. While especially important where harvesting is done by machines, there are worthwhile benefits from the practice even where cotton is hand-picked. Among the benefits, in general, are these:

Defoliation allows all bolls to be exposed to sunlight and air so they dry quickly, open up rapidly. This often permits earlier picking and more cotton is open for the first picking.

Defoliation applied ahead of leaf worm attacks or severe aphid infestations, eliminates some damage to open cotton. It also reduces boll weevil populations and robs late broods of food for overwintering. It permits earlier plowing under of residues for pink bollworm control.

Advantages of earlier and more even opening, added to higher machine efficiency and freedom from green stains, makes defoliation a must practice for harvesting with spindle pickers.

Brome Thins Quack

Quack grass can choke out most crops, but it makes no headway against brome. G. N. Brooks, superintendent of Hancock branch station in central Wisconsin, says quack dies out almost completely in old brome-alfalfa stands there. In straight alfalfa seedings it makes rapid, lusty growth. When brome is included in the stand, a root battle is on — and brome wins. When the mixture is seeded, quack must be well thinned to give young plants a start.

—Cappers Farmer

How to Grow Better Sweetpotatoes

Condensed from Crops and Soils

Henry M. Covington
Agricultural Extension Service, N. C. State College

THE American housewife prefers quality sweetpotatoes for the family table.

She will pay a premium price for those that are medium in size, well shaped and free from blemish or disease. She expects this product to be presented on the market in an attractive manner. This calls for potatoes that are well graded, washed, and sometimes waxed.

In recent years no crop has undergone a greater evolution in marketing methods than sweetpotatoes. Therefore, growers must use those practices which insure that the highest percentage of the harvested crop will meet consumer requirements. At the same time, they must maintain production of high yields.

Particular attention must be paid to seed selection, growing of plants, soil management, spacing in the row, cultivation, harvesting, handling, curing and storing.

Sweetpotatoes are grown commercially in areas where the climate and soils are such as to produce a product of desired quality. Differences in climate determine the variety grown and, to a certain degree, the quality of the crop produced.

The dry-fleshed types of sweetpotato are grown in the northeastern and midwestern states. The moist-fleshed "yam" types, of which the Porto Rico is the predominant variety, are grown almost exclusively in the South.

The production of vigorous, disease-free plants having desired varietal characteristics is one of the most important steps in successful sweetpotato production. The practices involved demand the careful attention of the grower not only during the period of bedding but in the preceding months as well.

The chain of events begins in the fall at harvest time and extends until the next spring when plants are ready to be set out in the field. In chronological order these events are: (1) seed selection, (2) handling, curing and storing of seed stock, (3) reselection at bedding time, (4) seed treatment, (5) plant-bed sanitation, (6) bedding, (7) plant-bed management, (8) pulling and care of plants.

Sweetpotatoes mutate or "run

Reprinted by permission from What's New in Crops & Soils
Madison, Wisconsin, August-September, 1950

out" at a rather rapid rate, especially as to skin and flesh color. Examination of each seed root at bedding time is necessary to maintain both of these characteristics. Flesh color is determined by "nicking" a shallow chip from the shoulder of the potato on the proximal end* of root.

Many of the serious field diseases, among them black rot and scurf, are carried from the bed to the field on plant roots taken from bedded potatoes which were diseased. To prevent these diseases, discard all roots at bedding time that show rotten spots, scurf or shriveled ends. Then treat them with semesan bel, bichloride of mercury, or borax.

Where permanent plant beds are used, the top 6 inches of soil and plant refuse from the previous season should be removed and hauled away. Drench the bed, framework and surrounding soil with formaldehyde at the rate of 1 pint to 15 gallons of water. Then haul in new soil.

The size of seed selected for bedding has an effect on the size and vigor of the plants produced. Roots 1½ inches in diameter or larger are preferred. However, seed stock 1 to 1½ inches in diameter makes acceptable plants, provided the bed is fertilized and the roots are spaced in the bed so as to prevent crowding of the plants.

* The proximal end of the root is that end nearest to the point where it was attached to the plant.

Plants should be pulled when they are 8 to 10 inches long. When smaller, they usually are tender and do not survive as well when transplanted. Should they become too tall in the bed, it is a good practice to cut the stems of the plants just above the soil line and use the cut plants as vine cuttings. This practice greatly reduces the chances of transferring seed-borne diseases into the field.

In areas of the South where the growing season is 6 months or longer, it has been found desirable to grow the fall or storage crop from vine cuttings. This type of plant material is obtained by one of two methods: (1) cutting vines from fields of early-set plants during late May and June; or (2) field bedding the roots in fertilized rows and allowing them to produce vines rather than pulling as plants. The latter system is often referred to as "mammy rows" or "run-downs."

Vine cuttings produce a high percentage of well-shaped, smooth potatoes, which are generally free of diseases such as black rot and scurf.

Growers, especially in the South, are prone to use very light, sandy soils for growing sweetpotatoes. On such soils the crop produced is of excellent quality, but the yield per acre is invariably low. When dry weather is encountered during the latter stages

of development, "growth cracks" are excessive.

High yields of quality sweetpotatoes are produced on well-drained loams and sandy loams. Heavy clay soils produce rough, misshapen and crooked roots.

Sweetpotatoes should be planted and grown on broad ridges 12 to 14 inches high. Some growers plant on low ridges and build them up to desired height by working the soil to the plants during cultivation, but this is not recommended. High ridges provide adequate drainage throughout the year and facilitate harvesting. It is difficult to harvest the potatoes from low ridges without cutting and bruising the roots.

A formula approximating a 3-9-9, when applied at the rate of 1,000 to 1,200 pounds per acre, will give good results on most soils. Excessive amounts of nitrogen, especially from organic sources, cause heavy vine growth, and the result is a low yield of poor-quality roots.

There seems to be conflicting ideas among growers as to the best sources of potash. No significant difference has been found in yield or quality regardless of the source of potash used. Sweetpotatoes seem to be very tolerant of chlorine.

Sweetpotatoes should not be grown after commercial vegetables, legumes, or legumes grown in combination with other crops. The nitrogen produced causes excessive vegetative growth and low yields of marketable roots.

The best crops to precede sweetpotatoes in rotation seem to be cotton, corn without legumes, and tobacco. Following harvested small grain with sweetpotatoes is a good practice, provided wireworms are not a problem.

"Jumbos" are one of the major problems in growing sweetpotatoes, but they can be kept to a minimum by proper spacing of plants in the row. This spacing must be learned by experience, since it will vary—depending upon the length of the growing season, the general productivity of the soil, and the amount and analysis of fertilizer used.

Assuming a late fall harvest, good soil and recommended fertilization, the earlier sweetpotatoes are planted the closer the spacing should be. Average recommendations are as follows: April planting—6 to 8 inches; May—8 to 10 inches; June—10 to 12 inches. On the other hand, when they are planted extremely early for harvest in July and August, they should be spaced 14 to 16 inches apart.

Time of planting affects the general shape of the roots in the Porto Rico variety. If planted before the last of May, a high percentage of the crop is "turnip-shaped," which is very undesirable. Roots of the ideal shape—5

to 7 inches long and tapering to both ends—are produced by planting between the last of May and the last of June. July-planted potatoes are unusually long for their diameter, and the yield is likely to be quite low.

Turning sweetpotato vines for cultivating the crop has been an accepted practice for many years. It is now recommended that the vines be "laid by" or "hilled out" when they are 8 to 12 inches long and before it becomes necessary to turn them. With proper fertilization, the vines cover the ground rapidly and shade out the grass and weeds.

Cultivating after the vines are 12 inches long cuts feeder roots and reduces the yield.

Sweetpotatoes do not mature and should, therefore, be harvested before killing frost, as soon as the majority of roots has reached the U. S. No. 1 size (1⅞ inches to 3¾ inches in diameter). The size can best be determined by trial diggings. It usually takes 4 to 4½ months of growing season to make maximum yield of proper size.

Until recently, sweetpotato harvesting has been a very expensive and laborious task. Equipment is now available that will cut the vines and dig the potatoes so as to expose at least 90 per cent of the roots in a single operation. This greatly reduces labor requirements.

No equipment has yet been invented that will grade the potatoes in the field and put them into containers without severe bruising.

Bruising greatly reduces the appearance and keeping qualities of the roots and, therefore, they must be handled as carefully as eggs from the time of harvest until they are sold.

Curing is primarily a process of healing cuts and bruises. Chemical changes also take place during the curing process, especially with yam-type varieties. These changes greatly increase the sugar content and improve the edible quality of sweetpotatoes.

To prevent rotting, curing should take place immediately after the potatoes are harvested.

It has been found that a temperature of 85° F. with 85 to 92 per cent relative humidity provide optimum conditions for curing the roots. It is advisable to have the house at 75° F., or slightly above this temperature, when the first potatoes are stored. Never wait until the house is filled before supplying heat.

Although high relative humidity is desirable, adequate ventilation must be provided to prevent excessive condensation of moisture on the walls and ceiling. A 1,000-bushel lot of sweetpotatoes will lose a minimum of 300 gallons of water during the 10- to 14-day curing period.

After the potatoes have been properly cured, the storage temperature should be maintained at 50–55° F.

Sweetpotatoes should not be washed until they are ready to be sold and shipped.

Thus we can see that, although an acre of sweetpotatoes requires less labor than most of our major row-planted cash crops, it takes careful management to produce a crop that will meet the demand of the American housewife.

Hogs Will Clean Up Corn Fields

Hogging down corn is an economical and labor saving method of fattening pigs, reports W. N. McMillen, animal husbandry specialist at Michigan State College.

Pigs usually make more efficient use of corn in the field than if the same corn were husked and fed. Success of hogging down corn depends upon the weight of the pigs used, season, character of the soil, and other factors. Well grown pigs in average flesh, weighing about 100 to 125 pounds appear to be the best adapted to hogging down corn. Fleshy pigs should never be turned in the corn field.

Reasonably dry weather is best. Rain and muddy fields cause a loss of grain and possibly pneumonia, McMillen points out.

Pigs should be accustomed to the corn field conditions by turning them into a small patch first. A considerable saving of feed is generally effected then by turning them into portions of the field that they will clean up in 10 to 14 days. Pigs should not be forced to clean up the corn field too closely. Brood sows or stock pigs can clean up any grain left by the fattening pigs.

Pigs on a full feed of corn need some protein supplement. This need may be reduced if pigs are given access to a green pasture while they are in the corn.

Full feeding the hogs in dry-lot for a week or two after removing them from the corn field is advisable. Very economical gains are generally made when a good ration is fed for a short time.

Hogging down of small grain, McMillen states, is regarded as unsatisfactory unless it is a matter of salvaging a hail-or-wind-damaged crop or when grain is very cheap.

—*Hog Breeders*

Grub Control in Sheep

Condensed from the Dakota Farmer

Dr. D. F. Eveleth

MANY sheepmen consider "grub in the head" as one of the more serious diseases of sheep. While actual death losses from larvae of the sheep head fly, *Oestrus Ovis,* are low, losses due to failure to make proper gains may be quite high.

The flies mature during periods of warm weather, and soon deposit young larvae (they bear living young instead of laying eggs) into the nostrils of sheep. This process is annoying to sheep —they bunch up, holding their heads near the ground in an attempt to prevent the flies from reaching their noses. In some cases the sheep run about wildly in an attempt to escape the flies.

After the larvae are in the sheep's nostrils, they migrate higher into the sinuses and remain there, gradually increasing in size. They do not mature until the next spring, often a period of nine months or more.

These growing larvae are irritating and cause a constant flow of mucus and nasal discharge. If the infestation is severe, there may be actual hemorrhage. Some larvae may actually bore through the head bones and enter the brain, but this condition appears to be rare. Heavy infestation of grubs actually may be an indirect cause of death by producing a continued loss of weight of the sheep.

Control programs, directed at killing larvae in the head of sheep, have not been successful because of difficulty in reaching the infection. Saponified cresol, injected as a spray, has been found useful in the southwest. Climate and husbandry practices of the northwest are such that it is possible to destroy many of the larvae by freezing, or by not allowing flies to contact the sheep. The flock may then be kept on summer range, far enough removed from winter quarters to prevent infestation.

After the larvae mature in the sinuses of the sheep, they drop to the ground and burrow in. Later, as weather becomes warmer, the flies emerge. They mate and die within a period of a couple of weeks. Unless the female fly has had opportunity to deposit larvae in the nostril of a sheep during this period, the cycle is broken. The female fly does not travel far, not to exceed a mile (probably much less) and only moves during

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warm days — preferably in sunlight.

Sheep should be wintered as far as possible from summer ranges. If at all possible, they should be wintered in low areas where the larvae will fall on the ground. When it becomes flooded in spring, many of the larvae will be destroyed. In late winter and spring, during the period in which the larvae are leaving the sheep, they should not be grazed on pastures to be used during summer —nor should they be allowed to drink at watering places to be used during summer.

When sheep are placed on summer pastures, they should be allowed to graze early in the morning and late in the evening. During the warmest part of the day, they should have shelter which is quite dark. A low structure with a tight roof, walls extending from the roof to about eight inches from the ground, but open to the north to allow for ventilation, is quite satisfactory for a farm flock. Such a shed is preferably placed on a hillside so that drainage is good. If the shed is dry, it will not be a serious factor in building up the population of internal parasites. This shed should be placed as far as possible from winter bedgrounds.

As an alternative for dense shade, such as would be provided by a shed, it is possible to use a grove or shelter belt of trees, large enough to furnish shade. Dense thickets along streams may also be used.

Many grubs can be destroyed by thoroughly cleaning barns and lots during the spring. It is possible to determine the time larvae leave the sheep by watching the flock. When sheep are sneezing, a careful inspection of the ground should be made; if grubs are causing the sneezing, they can be found on the ground.

During the summer grazing period, if the sheep bunch up, hold their heads low, and stamp their feet, it is advisable to move them at once to another range. If mature flies are kept from the sheep for one year, the problem of "grub in the head" will end.

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